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Transparencies and Their Future

RECENT applications of electric transparancies indicate a remarkable future for these equipments. But little thought is required to see the breadth of their field compared with more brilliant electric signs. One of the most significant applications is in the motion-picture theater where a clock dial illuminated without glare carries publicity matter of fixed or changing interest. Thousands of places where people congregate are for one reason or another dimly lighted a large part of the time, and here the transparency comes into its own. Without the slightest offense to the eye, or without serious detraction from other interests, electric signs of this type can be used in long-hour business to the advantage of central stations and manufacturers alike. The necessary diffusion or shielding of luminous flux requires substantial expenditure of energy behind the glass or other media employed; this is good for the electrical interests concerned, and it is still worth the cost to the advertiser, because he makes his appeal in locations where the public is peculiarly susceptive to suggestions. It all goes to show how much can be done if discrimination and taste are combined, and we commend to our central-station readers the more detailed consideration of transparency possibilities as further outlet for their energy.

Standard Voltages for Rural Lighting Plants

IS it desirable, necessary or expedient to introduce equipments and fittings designed for operation and use throughout the country at a potential of 30 to 50 volts on the same basis as the 110-volt and 220-volt systems generally recognized as standard?

The somewhat recent but widespread propaganda relative to small isolated lighting equipments or farm-lighting units driven by gasoline and oil engines presents this question in an acute manner for the immediate attention and consideration of manufacturers of wiring supplies and utilization equipments, jobbers and contractors and inspection authorities as well.

There are two prime reasons why the promoters of farm lighting plants choose to exploit low-voltage apparatus, one being the lower cost of the auxiliary storage battery, and the other being the decreased danger or elimination of shock from accidental contact with or handling of live metal or current-carrying parts of such equipments. These features both conduce to the salesman's advantage, but, on the other hand, the customer is left to provide his own fixtures and utilization apparatus to be purchased in the open market. In many instances supplies for 30-volt circuits are not available at all, or, if materials at present on the market and considered as standard are used, conditions may obtain which are not only unsatisfactory to the user, but which introduce as well unexpected hazards as to fire.

For example, consider the use of ordinary lighting fixtures wired with No. 18 B. & S. gauge wire with one sixty-fourth-inch rubber insulation subjected to three or four times the current intended or expected when used on 110-volt circuits. Or, take a house or store perhaps already wired with No. 14 B. & S. gauge wire and equipped with No. 18 B. & S. gauge pendent cords, what percentage loss in distribution is likely to result when supplied from a 32-volt system?

And perchance, the farmer's wife aspires to the use of an electric pressing iron or toaster, both of which ordinarily are rated, say, at 660 watts, and would require 18 to 20 amperes for the same service on a 30-volt circuit. Are such devices to be connected to ordinary pull-chain or key sockets attached to fixtures and supplied through fixture wire or flexible cords? The possibilities of serious hazards resulting from such practice call for careful consideration of the voltage of these plants. It is manifest that, if this voltage cannot be raised to that now standard for practically all city lighting systems, a radical change must be made in the wiring installed with the low-voltage plants.

The Advertising Value of Electrification

THE announcement that the Chicago, Milwaukee & St. Paul railroad is to immediately extend its electrified zone is a significant one in many respects. In the first place, it is the most conclusive evidence that the electrification of trunk lines is economically sound. Practically all of the engineering difficulties which could possibly confront a project of this kind have, in this installation, been met and successfully overcome, and electric motive power has once again demonstrated its superiority.

Another phase which is worthy of particular note is the advertising value of electrification, as has been so forcibly demonstrated during the past few months. The Chicago, Milwaukee & St. Paul, on the completion of its present installation, promptly capitalized on this advertising value by a comprehensive cam-

paign including magazine, newspaper and billboard displays calling attention to the novelty of being transported electrically and emphasizing the comforts and luxury of travel over the electrified zone. Aside from this a great deal of valuable publicity was given the railroad in all of the technical and popular literature of the country, and newspapers generally commented at length on the progressiveness shown by the company and more particularly on the advantages of travel over electrified roads.

While the advertising value of electrification is an intangible item, it is, nevertheless, a feature that should be given serious consideration when the advisability of changing over from steam is contemplated.

Engineering Profits in Utility Management

A QUESTION of much interest in connection with the centralized management of public utilities is whether the controlling syndicate should be allowed to make a profit upon engineering services within its own organization for companies under its particular management. The point has arisen a number of times lately, in connection with security issue cases before public regulating authorities, and in one instance at least, the commission has expressed its disapproval of charging a profit on services of this kind. The practice is in vogue among some of the most honorably conducted managing concerns in the business, and it is claimed by their representatives that, inasmuch as the engineering work for the operating companies can be done centrally at a lower cost than when locally performed, or when secured from an outside organization, no reasonable objection can be made to the charging of a fair profit upon such services.

It might be said in passing, that it is not always true that the engineering of a centralized controlling organization is intrinsically lower in cost, for now and then one comes across a local power company or central station whose officers and employees are unusually skilled in engineering. One such recently saved certainly $100,000 on a $3,000,000 job through the abilities of its home office, erecting a hydroelectric plant second to none in the territory from the technical standpoint and carrying every detail through from start to finish with an efficiency ordinarily found only in large and highly specialized organizations. But in general, the contention is well advanced that centralization pays in engineering as well as elsewhere; that through the co-operation of many men and many minds, the greater utility achievements of the day are brought to pass. In the purchase of supplies, preparation of specifications and plans, supervision of construction and inauguration of operations, the centralized organization, in general, may be said to be ideal.

What shall be said about the charging of a profit for engineering services? Perhaps the final test of expediency is this: Is the engineering organization dealing with itself on both sides of the table, or is it conducting business relations with others? Certainly, where outsiders employ the engineering staff of a centralized organization to perform work, a fair profit for the latter is absolutely proper. Again, when such an organization is asked to perform services for friendly but separate interests, there is no good reason apparent why such work should be done at cost. Finally we come to the case where the engineering organization has a regular part in the management of the utility. The line here is harder to draw, but in the long run, it is probable that a purely nominal profit above the actual total cost of doing the work will prove much the best policy.

Liberal compensation for services cannot fairly be denied, but the making of a profit on such services by virtue of a controlling voice on both sides of the table opens the door to attack, even when such a course is followed by an organization of high character. As the standards of business rise, it becomes clearer where the line is to be drawn between policies formerly unconsidered in relation to professional ethics but which must be tested from many viewpoints in order to measure up to present-day ideals.

Developments in Electric Fans.

THE extraordinary demand for electric fans last summer, due to the prolonged spell of very hot weather, depleted the stocks both of dealers and manufacturers of these useful appliances. The makers were therefore confronted with exceptionally difficult conditions, in that special efforts had to be made to restore the stocks of standard lines and this under very trying general manufacturing conditions. Consequently relatively few radical developments in electric-fan design have been announced.

In spite of the difficulties confronting the manufacturers a number of innovations have been made in new types of fans, as illustrated on other pages of this issue. Several makers have improved their lines by the introduction of intermediate sizes, so that while formerly the 8, 12 and 16-inch sizes were practically the only ones available for desk and bracket fans, now there can be obtained desk fans ranging from four inches in diameter upward in over a half-dozen different sizes. The drawn-steel type of frame construction is also being used more extensively. A number of manufacturers, due no doubt to the high cost and difficulty of obtaining brass, have introduced the use of black japanned steel guards and even blades in some instances. This probably will eliminate the tarnishing which so commonly is noticed in desk and table fans. Whether it will prove a popular feature it is too early to say.

At any rate the supply of electric fans is now much more complete than ever before so that it is possible to secure exactly the type of fan required for any particular need. Consequently, it is to be expected that a still greater increase in the sale and use of these appliances will be witnessed this year.

HAPPENINGS IN THE INDUSTRY

Co-operation with Central Stations Discussed at Chicago Convention of Illinois Contractors Association—Promotion of Electrical Safety Important Problem for Inspectors as Shown in Toledo Convention—Bill to Create Public Service Commission in Texas Introduced in Legislature—Miscellaneous News Notes

CO-OPERATION WITH CENTRAL STATIONS DISCUSSED BY ILLINOIS CONTRACTORS.

Report of Chicago Convention of Illinois Electrical Contractors' Association.

Featured among the chief topics of discussion at the mid-winter convention of the Illinois Electrical Contractors' Association, held at the Hotel Sherman, Chicago, Ill., January 27-28, were the subjects of co-operation between electrical contractors and central-station companies and of estimating, selling prices and selling policies.

The convention was called to order Thursday morning by President N. F. Pierce, of Chicago, who in his opening address stated that progress in estimating methods had been evidenced recently to such an extent that contractors could now afford to pay more attention to their selling methods. He was particularly insistent that contractors should get away from "curbstone" methods of doing business.

He introduced Anderson Pace, of the Chicago Association of Commerce, and a member of the research committee of the Advertising Association of Chicago, who welcomed the contractors to Chicago. In the course of his remarks he outlined some of the problems which assail contractors in general, speaking of the detriments caused by price cutting and inefficient sales methods. He closed by submitting a proposition to let the research committee investigate sales methods used by Illinois contractors, to be followed by a report at the next meeting of the Association.

President Pierce then introduced John F. Gilchrist, vice-president of the Commonwealth Edison Company, Chicago, who after introductory remarks read a paper dealing with the relations between contractors and central stations. In his opening remarks he commented on the tremendous increases being made in the volume of electrical business. He said that economies in conducting this business could be made by companies acquiring a greater area of operation. Insofar as central-station companies are concerned, he predicted a wide interconnection of electric plants and said that he expected that in time the entire state of Illinois would be served by four or five systems, thus effecting necessary economies.

Mr. Gilchrist said that contractors and central stations were brothers in the same business, both essential to one another, a fact that works for co-operation. There are innumerable ways in which the central-station company can aid the contractor in his business and the rule works both ways. He said the contracting business was one of detail, in which there was a temptation to do work at low prices and then "put it over" on the customer to make a profit. These inclinations and those of price buying and selling must give way to good business organization, in which must prevail good cost accounting and sales methods. He said that next to food and clothing, electricity has become the public's greatest necessity and that only the crust of the possibilities in the electrical industry has been broken.

At the closed session Thursday afternoon John Merron, of Rock Island, reported on central-station co-operation, and Mr. Gilchrist's speech and line of thought were discussed. S. N. Tiedemann, of Chicago, submitted a report on the possible result of electrolysis attendant upon a general use of concentric wiring.

An address on "Selling at a Profit," by H. L. Grant, sales manager, Western Electric Company, Chicago, was first on Friday morning's program. Mr. Grant spoke at length upon price-making policies of electrical jobbers, stating in detail methods employed in arriving at a fair price and then maintaining it. He also discussed the ethics of price-making, declaring against price-fixing by collusion and against price-cutting practices. He said a fair price should be based on actual cost plus overhead and a fair profit, the latter to yield better than a banking rate on the same investment—in his opinion, 15 to 20 per cent. He expressed displeasure at the methods of the so-called curbstone jobbers, who destroy the confidence in prices established by jobbers with equitable business policies. He highly commended the evident policy of uplift in the contracting business.

E. H. Cameron, sales manager, National X-Ray Reflector Company, spoke on "Selling Versus Estimating," bringing out the point that contractors should compete on the basis of furnishing service and ideas rather than on price basis, that the idea of service should be sold before equipment. Contractors should take every advantage to sell accessories as well as wiring. He closed by saying the contractor does not realize the power of his strength in the electrical industry.

Friday afternoon, W. A. Durgin, lighting engineer, Commonwealth Edison Company, gave a lecture on "Applied Illumination," demonstrating with elaborate equipment his interesting and instructive talk on lighting, which was received with very favorable comment. Following the lecture the Association convened for its last, a closed session, at which L. B. Van Nuys, of Peoria, described how his city and contractors there had benefited by America's Electrical Week activities. Ernest Freeman, of Chicago, made a report on the last convention of the national association. It was decided to hold the next convention in Peoria in June.

PROMOTION OF ELECTRICAL SAFETY IS IMPORTANT PROBLEM FOR INSPECTORS.

Report of Concluding Sessions of Annual Convention of Western Association of Electrical Inspectors.

That safety to life as well as property is becoming an increasing concern of the electrical inspector was shown in the concluding sessions of the twelfth annual convention of the Western Association of Electrical Inspectors, held at Toledo, O., on January 23 to 25. The Tuesday sessions were reported in the last issue.

Field Trial of the National Electrical Safety Code.

A paper on this subject prepared by E. B. Rosa, of the Bureau of Standards, Washington, D. C., was read by W. J. Canada at the opening of the Wednesday session. Probably the most logical way to introduce this new Code is to begin with new installations, which can manifestly be adapted to electrical safety requirements at little expense and trouble. Dr. Rosa suggested that application of the Safety Code to existing installations be confined (at first) to only the most hazardous.

As regards utilization installations, the National Electrical Safety Code gives rules principally as to service switches, grounding, protection of live terminals, insulating mats, guarding of moving electrical machinery, etc. Such installations come within the jurisdiction of most electrical inspectors. In

its application to station installations its rules are not severe where access is given to electrically trained employees only; the rules cover principally the special guarding of live parts and general safeguarding of moving machinery. The station rules are easy to enforce.

The safety rules for line construction are more particular, especially for overhead lines, on account of the greater hazard to the public involved. They relate among other things to the crossing of overhead lines with railways, highways, and other overhead lines which require special consideration, particularly of sags and clearances.

The extension of electrical inspection to cover safety in new work is probably not difficult. In the case of large inspection corps it can be provided by assigning one or more inspectors to safety work. In Pennsylvania the State Industrial Commission has arranged with the fire underwriters to inspect both for fire and life hazards, this being the first case of insurance inspectors undertaking life-hazard inspections.

Reinspection of old installations is usually very limited, but is very necessary where hazards are known to exist. It requires much judgment to determine whether minor changes will suffice or complete rehabilitation is necessary. Line reinspections are most important, since clearances are frequently found to be insufficient. Such inspections are not difficult; they should be frequent and effective, the aim being to produce the highest practicable degree of safety.

A paper by R. J. McClelland, chairman of the Technical Section, N. E. L. A., was then read by H. B. Gear, of Chicago. This paper was entitled "The Central Station's Attitude Toward the National Electrical Safety Code and Its Field Trial." Nearly all utility men agree in supervision of safety features of circuits and it is much better to have this supervision based on national than on a mass of conflicting local rules. To most of the new Safety Code there are no objections, but as regards a few of the rules it is probable that the requirements are ahead of present practice. Much depends upon the good judgment of the inspectors on whom enforcement will depend.

Mr. McClelland suggested that the Bureau of Standards publish special pamphlets dealing with particular parts of the Code in order to make available in convenient form the rules dealing with specially important features, such as line crossings, joint use of poles, etc. It is unfortunate that several states are now planning to issue electrical safety rules which are at conflict with the new National Electrical Safety Code; possibly this is due to the formidable bulk of the new Code. Therefore a piecemeal adoption of the new Code is probably better than immediate general and complete adoption.

Mr. Gear, speaking for himself, explained why the central stations at first has feared the new Code; this was because three sections of it affected them quite seriously, particularly the rules applying to overhead line construction. These rules are very well suited to congested districts where the hazards necessarily are greatest. It was feared that the general adoption of these rules throughout the country would tend to hamper the construction of rural lines and put a heavy burden on their reconstruction. The paper was discussed further by F. D. Varnam, V. H. Tousley, W. J. Canada, B. Berssenbrugge, B. W. Clark, W. E. Richards and others.

Insulating Joints for Electric Light Fixtures.

At the afternoon session a paper prepared by J. C. Forsyth, New York City, was read by Secretary Boyd. It was shown that insulating joints are no longer used on straight electric fixtures in New York City and it has been found that this practice has had no objectionable results.

Mr. McCarthy, of the Macallen Company, discussed the subject from the manufacturer's standpoint, stating that his company had produced some 50,000,000 such joints in the last 25 years. To eliminate the joint will necessitate a reliable ground. In many cases it is impossible to get a satisfactory ground, however; in others the ground connection is likely to be disturbed or destroyed. Therefore he felt that it would be better to leave this matter with the local inspectors. A radical and sudden change should not be made.

H. R. Sargent, of the General Electric Company, speaking in behalf of socket manufacturers, said that these had no objection to the elimination of the insulating joint, since the socket lining is tested to 4,000 volts.

H. G. Boyers, Toledo, O., speaking for fixture manufacturers, said that thorough grounding of the fixture eliminates danger of contact with a live fixture, since the fuse will be blown in case of trouble. Fixture men are neutral on this matter, but see no reason for opposing elimination of the joint. In many cases the latter is objectionable on account of spoiling the looks of the fixture because use of the joint necessitates providing a canopy, which is not suited in the case of artistic brackets in particular.

Dana Pierce spoke of the practice in Providence, R. I., where there are various systems and voltages in use. Grounding of fixtures has been strictly insisted on for 16 years without a single troublesome result. H. B. Gear stated that all the wiring in Providence is polarized and the ungrounded wire is always connected to the inside of the socket.

A. R. Small cited tests of No. 18 fixture wire with one-sixty-fourth-inch insulation as giving 8,000 volts on immersion test. The trouble comes after pulling the wire into the fixture, which usually results in damaging its insulation at various places. The artistic requirements of fixture design prohibit the use of larger socket caps and therefore prevent the use of larger wires. Mr. Small believed the solution of the problem lies in insisting on absolutely strict factory inspection of fixtures.

W. J. Canada said the question should be under what conditions should the insulating joint be elimiated and when should it be insisted on. In earlier construction the joint reduced the fire hazard in cases where leakage occurred in fixtures. However, where these joints are used fires frequently do occur. Mr. Canada discussed the subject from the standpoints of fixture construction, fire hazard and life hazard. To eliminate the latter absolute grounding of the fixture is necessary, particularly so where damp or other permanently grounded surfaces are in proximity to the fixtures. There have been many cases of fatal and serious accidents due to ungrounded fixture casings. The solution is evidently in good grounding of all fixture cases in reach. Mr. Canada also suggested the use of non-metallic socket shells over and near damp places.

The subject was discussed further by B. Berssenbrugge, H. R. Markel, F. D. Varnam, F. L. Lucas, N. Rousseau and others.

Insulated Inlet Bushings for Sockets, Etc.

A paper on the advantages of the insulated inlet bushing for sockets and outlet-box covers was presented by F. D. Varnam, St. Paul, Minn. Trouble from abrasion of the cord or wire exists particularly in portable and drop lamps. The use of reinforced cord is not a complete solution of the trouble. If insulated outlets are required in conduit terminals, etc., they should also be required in outlet boxes and sockets, because the latter are much weaker and much more subject to abuse. The insulated bushing provides not only insulation but relieves the wire of the danger from mechanical wear.

Dana Pierce, New York City, took the other side of the question, stating that he did not believe the insulating bushing is really necessary. In many cases it is an actual nuisance. A smooth rounded outlet surface is all that is required. The bushing is a detail that is of little consequence. In pendent sockets special pendent caps now on the market should be used; these are provided with a self-contained bushing. The ordinary small, threaded, hard-rubber bushing is no good at all.

Committee Reports.

F. D. Varnam, chairman of the Committee on National Electrical Code, presented the report of this committee in which certain changes to the Code were recommended.

These were discussed in considerable detail and certain of them recommended to be referred to the Electrical Committee of the National Fire Protection Association.

The report of the Committee on Outside Wiring was read by V. H. Tousley. This dealt with roof-top construction for miscellaneous signal circuits and gave specifications therefor. It was strongly urged that this type of construction be entirely eliminated within a period of five years. The matter was discussed by F. R. Daniel, G. W. See, F. L. Lucas, B. Berssenbrugge, W. J. Canada and A. R. Small.

At the Thursday morning session further consideration of committee reports occupied the program. The first of these was a report of the Committee on Show Window and Display Lighting read by Secretary Boyd. This urged continuance of the educational campaign for eliminating show-window hazards.

O. M. Frykman read the report of the Committee on Construction and Installation of Electric Signs, in which mention was made of the case of a large sign which was completely burned out by a fire starting in a flasher box and traveling some 25 feet through three-inch conduit.

Guy W. See read the report of the Committee on Underground Systems. It was recommended that lead-covered cables should not be laid bare in the ground.

The Committee on Instructions to the Public Concerning the Safe Operation and Maintenance of Electric Wiring and Apparatus presented a report through its chairman, R. E. Knox. Points that should be emphasized are the dangers resulting from makeshifts. The inspector is hampered on account of the difficulties of calling attention to these dangers and also by the embarrassment resulting from different interpretations of rules. The formation of clubs or conferences was recommended in the larger cities whereby inspectors and others interested in such construction could meet frequently and discuss their problems. The case of the Louisville Electrical Clearing House was cited as an excellent example of such co-operative conferences.

F. L. Lucas read the report of the Committee on Theater Wiring and Show Equipment. This made a strong plea in favor of using slow-burning wire for strips. A test of one of these that had been immersed was made. Certain changes in the Code were recommended and were reported to the Code Committee. The report was discussed by B. Berssenbrugge, G. W. See, A. P. Good, F. Waldenfels and V. H. Tousley.

J. R. Morrissey presented the report of the Committee on Signal Systems, which dwelt particularly with the grounding of fire-alarm boxes. W. J. Canada said the results of tests by the Bureau of Standards show that driven grounds are not dependable unless the soil conditions are especially good. R. J. Gaskill described a new pipe used for insulating the ground wire which seems to be very much superior to using insulating joints.

F. R. Daniel submitted the report of the Committee on Electric Traction Systems, which discussed in detail the sizes of leads for car wiring. The Code rule on this subject is quite satisfactory but it is desirable to use heavier wire for cars operating in hilly cities because of the heavy continuous demands in such places.

The report of the Committee on Rubber-Covered Wire was presented by V. H. Tousley. The Committee on Gas-Filled Lamps, Fixtures and Wiring presented a report read by Secretary Boyd. This discussed at length the heating of these lamps and the necessity for good ventilation where they are used.

Emil Anderson presented the report of the Committee on Concentric Wiring. The advantages and disadvantages of this proposed system were summarized very completely. No decided enthusiasm for this system has been noted. It was therefore recommended that no further action be taken respecting this matter.

The last committee report was that of the Committee on Elevator Wiring, which was presented by H. M. Maxwell. Many improved features of construction and wiring were recommended.

Miscellaneous Inspection Problems.

The concluding session consisted chiefly of a general discussion of problems coming up in the experience of various inspectors. B. Berssenbrugge, Milwaukee, Wis., presented a number of these, of which one was a proposed reclassification of plug fuses; this will be described in a later issue. Other problems were those of using two-pole switches for three-wire subfeeders, insulation of X-ray machines, wiring of welding machines, demand-factors of apartment houses with large numbers of ranges, and iron outlets in cabinets.

F. H. Moore presented the problem of approved wiring of services for several stores in a single building without hall or basement. B. W. Clark suggested that a service conduit be run outside of the wall with a service tap through the wall for each tenant. Other problems presented were how to handle municipal inspection for large industrial plants, clearance of lines crossing roofs, etc.

The final action of the convention was the election of officers for the ensuing year, which resulted as follows: President, Emil Anderson, Minneapolis, Minn.; first vice-president, F. L. Lucas, Toledo, O.; second vice-president, C. K. Cregier, Chicago; secretary-treasurer, Wm. S. Boyd, Chicago; executive committee, W. E. Flickinger, Detroit, Mich.; R. E. Knox, Louisville, Ky.; C. I. Wagner, Joliet, Ill.; H. R. Markel, Columbus, O.; C. L. Reasoner, Colorado Springs, Colo.; E. C. Horton, Buffalo, N. Y.

Liberal entertainment features were provided by the Toledo committee in charge of arrangements, of which F. L. Lucas was chairman. On Tuesday evening a smoker was given. On Wednesday there was a Jovian luncheon and a dinner with the Electrical Club of Toledo. Thursday evening the Toledo electrical interests gave a complimentary banquet to the Association and its guests. Friday was devoted almost entirely to inspection trips in and near Toledo.

Annual Convention of Northern White Cedar Association.

The twenty-first annual convention of the Northern White Cedar Association was held at the Radisson Hotel, Minneapolis, Minn., January 30 and 31, and was in every respect the most successful ever held by the Association. Practically the entire membership was present and much enthusiasm was shown at the constructive work accomplished during the past year by the various committees.

H. F. Partridge, president of the Association, delivered a very able address at the opening of the convention and Secretary Boucher presented a comprehensive report, reviewing the work accomplished during 1916. The advertising campaign, which has been conducted in the electrical journals during the past year, has produced splendid results and was praised by all of the members. It was decided that this should be continued at least another year.

The election of officers for the ensuing year was held with the following results:

President, J. C. Kirkpatrick, president National Pole Company, Escanaba, Mich.

Vice-president, J. E. Gerich, president MacGillis & Gibbs Company, Milwaukee, Wis.

Treasurer, W. B. Thomas, Manistique, Mich.

Secretary, N. E. Boucher, Minneapolis, Minn.

The new directors elected were: L. A. Furlong, of the Valentine-Clark Company and T. M. Partridge, of the T. M. Partridge Company.

The annual banquet was held on Tuesday evening, January 30.

Miscellaneous NEWS NOTES

Address on Polyphase Motors at Philadelphia Meeting.—At a meeting of the Philadelphia Section of the Association of Iron and Steel Electrical Engineers to be held at the Majestic Hotel, in Philadelphia, February 3, James Burke, president of the Burke Electric Company, Erie, Pa., will speak on the subject of "Polyphase Motors."

Kansas City Club Affiliates With Jovian Order.—The Electric Club of Kansas City, Mo., has changed its name, constitution and by-laws, so that now it is a branch of the Jovian Order under the title "Jovian Electric League of Kansas City." Efforts will continue to secure memberships in the Jovian Order, but non-Jovians will be welcomed into the league. There are 30 candidates for a rejuvenation to be held within a few days.

New York Company to Reduce Rates.—The New York Public Service Commission has taken under consideration a voluntary offer made by the New York & Queens Electric Light & Power Company to reduce the maximum rate for electrical energy. It proposes to cut the rate from 12 cents to 9 cents per kilowatt-hour, with certain provisos. The company proposes to end its system of charging $1.00 per month as a minimum and to institute a new service or meter charge of 60 cents per month.

Merger of Union Electric and Perry County Companies.—On January 22 the Union Electric Light & Power Company of St. Louis completed consolidation details with the Perry County Utilities Company, the merger having been approved by the Missouri Public Service Commission. The Union Electric has a capital stock of $18,000,000, while that of the Perry County Company is $40,000. George R. Sheldon owns 95,775 shares of common stock of the consolidated company, while the Union company owns 3,015 shares.

Predicts Industrial Strife After War.—At a recent meeting of the Veteran Employees' Association of the Westinghouse Electric & Manufacturing Company, G. E. Tripp, chairman of the board of directors of the company, delivered a forceful address dealing with trade conditions after the war, in which he predicted that this country would meet an united Europe and that an industrial war would undoubtedly ensue from which the people of the United States should draw a lesson of thinking, talking and acting preparedness.

Utility Franchise Tax in New Jersey.—A bill has been introduced in the New Jersey Legislature providing for a graduated tax on all public utilities in the state, to a maximum amount of five per cent on gross receipts. The tax is to commence at three per cent a year, and be increased one per cent a year until the maximum is reached. This plan is a compromise over the original suggestion of the state officials elected to office, which provided for an immediate imposition of the five-per-cent tax. The New Jersey Utilities Association, with membership comprising about 100 utilities operating in the state, will endeavor to use its influence against the passage of the bill, holding that such is unreasonable and unjust.

High Costs Discussed by St. Louis League.—The St. Louis Jovian League had for its speaker January 16, Prof. William F. Gephart, professor of economics, Washington University, whose subject was "Some Economic Aspects of the High Cost of Living." In a well prepared address in which statistics were cited from agricultural reports of the leading food-producing nations of the world, it was shown that the food products yield for the year 1916 was below the average, besides which an increasing demand for service—delivery, individual packages, etc.—contributed to the present inflated prices of commodities. Prof. A. S. Langsdorf, professor of electrical engineering and dean of the School of Engineering, Washington University, presided as chairman of the meeting, at which there was a large attendance.

Representatives of Illinois Power Companies Hold Conference in St. Louis.—Managers of the plants of the Southern Illinois Light & Power Company and the Saline Electric Company, which operate electric-lighting, street railways and other utilities in 55 towns in Southern Illinois, held a two-day conference in St. Louis recently. The sessions were devoted to administrative and new-business discussions and were followed by a social gathering.

New York Commission to Investigate Bronx Rates.—The Public Service Commission for the First District, New York, will begin an investigation into the rates charged for electricity by the Bronx Gas & Electric Company and the Westchester Lighting Company which two companies furnish electrical energy in all portions of the Bronx not served by the New York Edison Company. The Westchester Lighting Company at the present time has a maximum rate of 10 cents per kilowatt-hour, while the Bronx Gas & Electric Company maintains a maximum rate of 12 cents per kilowatt-hour.

Students to Design University Buildings.—Senior class students in the College of Mechanical and Electrical Engineering of the University of Kentucky will begin making plans for new shops, steam and electrical laboratories which it is hoped the Kentucky Legislature will make appropriations for at the coming session. The 22 members of the class will be organized as a modern consulting engineers' office and will design the projected additions to mechanical hall with a view to expediting the work of actual construction and installation when the appropriation for the proposed improvements does become available.

Electric Power Used for Water-Plant Operation in Lancaster.—Effective January 24, electric power was substituted for steam power operation at the municipal waterworks Lancaster, Pa. Seven motor-driven pumps have been installed to replace three steam-driven units, with capacity of 21,000,000 gallons a day, two of the pumps being employed for forcing the water to the filter plant. Electric energy is furnished from the McCalls Ferry power station. One of the steam pumps of 10,000,000 gallons capacity will be retained for emergency service. Citizens recently voted $125,000 for the improvement.

New Lighting Projects for Denver.—Last week the first of a series of new lighting projects for Denver, Colo., which promise to effect big improvements in various districts of the city, was submitted to the City Council. The first is an ordinance for the installation of an ornamental system on Fourteenth Street from Colfax Avenue to the Platte River viaduct, to cost approximately $15,000, which property owners have agreed to pay. The plan calls for the most ambitious design on any street or boulevard in the city. The cost of the standards will be $150 each. Another project submitted at the same time was in the form of a petition from residents in the Park Hill district, where plans were prepared for the installation of a total of 274 new street lamps.

Traction Company Pays Under Protest.—The Puget Sound Traction, Light & Power Company, of Seattle, Wash., has offered under protest to the city $64,387.78, representing two per cent of its gross earnings during 1916. The company stipulates that this payment is to be made only in the event that the city lives up to an agreement reached at a conference in 1915 by which the electric company was to pay a gross income tax under protest and to plank instead of paving right of way, pending a hearing of the Public Service Commission on a petition to be relieved of certain franchise obligations. In the event that the city does not agree to this and insists on starting suit, requiring the company to pave its right of way, the tender of the gross earnings tax is to be withdrawn.

Electricity in Machine-Tool Operation

The Advantages of Electric Drive, With Notes on the Application of Individual and Group Drives, Selection of Motors, Controllers, and Power Requirements of Machine Tools

Industrial Power Series—Article No. 190

ONE of the most important phases influencing the successful conduct of any manufacturing business is the output obtainable with a given personnel, tool equipment, floor space and working time. Without any of these factors, the substitution of mechanical drive by the installation of electric motors has variously augmented the productive capacity of different shops from 5 to 100 per cent. In other words, a greater amount of work is produced per operative per machine per day, due to maintenance of constant speed under varying conditions of load. The ease with which the cutting speed can be sustained throughout a given operation; the advantage gained by better arrangement in regard to natural or artificial lighting facilities, as well as in the access to and sequence of material from the unfinished to the finished state; the greater cleanliness, purer air and generally better hygienic surroundings of the motor-driven shop which react favorably upon the health, cheerfulness and activity of the operatives are other advantages.

While increased production is obviously the most important result attained by the use of electric drive, it is also true that direct economies are very frequently found in the power costs. Apart from the saving in energy made possible by the ability of the operator to shut down those machines not engaged in productive work, the elimination of shafting, belts, pulleys, idlers, etc., which form an indispensable part of the mechanical system of drive, must of necessity result in important power economies, especially if it is remembered that mechanical drive often consumes from one-half to four times the energy required by the machines themselves. With individual motor drive the maximum power is made effective at the tool itself.

The many and efficient types of controllers now commercially available enable the operator to vary the tool speed readily and quickly by simply moving a handle which may be conveniently located for ready manipulation. The tendency on the part of the workman to avoid irksome belt shifts often has for result the insistent use of incorrect cutting speeds. The physical ease accompanying electric control entirely removes this temptation, at once expediting the work and enhancing the productive capacity.

Where individual motors are employed, the most convenient and logical location of the machines may be secured, space easily provided for additional machines, use of overhead cranes facilitated, and other requisites to a profitably conducted shop made possible. Night or day, electric motors are always ready. A rush job requiring the partial use of the machine equipment can be put through without entailing disproportionate power costs. The maintenance charge for electric drive is negligible, since expensive belt renewals, oiling and care of shafting hangers, etc., are largely eliminated. Motors are of simple and sturdy construction, and, apart from occasional oiling, require practically no attention.

Motors may often be applied to machines originally designed for mechanical drives, the change over being effected with practically the simplicity and ease attendant where the apparatus is especially arranged for individual electric drive. With individual electric drive only the power actually used for the work in hand is paid for. With mechanical drives idle machines and their auxiliary transmission systems waste power and consume the profits. The use of portable motor-driven equipment often enables the tool to be carried to the work, which is an important consideration where the work is of heavy character. There is no idle shafting nor belts necessary where individual drive is used and the machine tool and the motor form a complete unit economical in floor space, easily con-

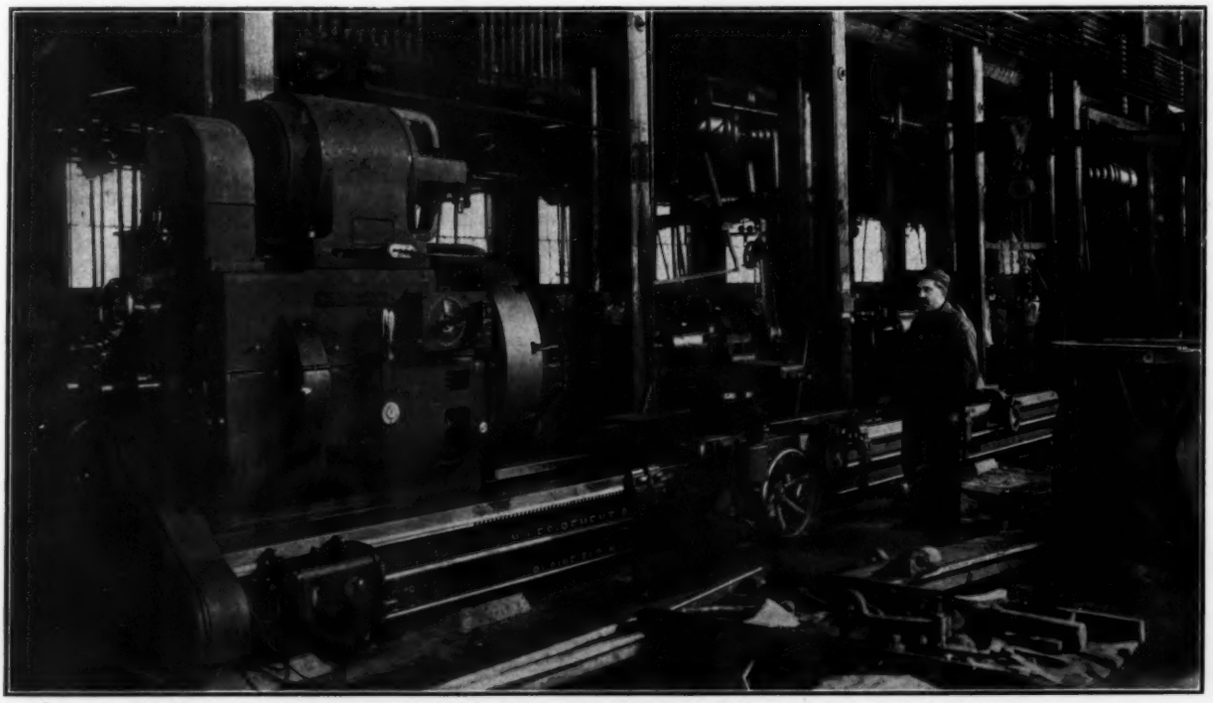


Fig. 1.—A Large Engine Lathe Driven by a 20-Horsepower Direct-Connected Motor. A Two-Horsepower Motor is Used for Operating the Tool Carriage.

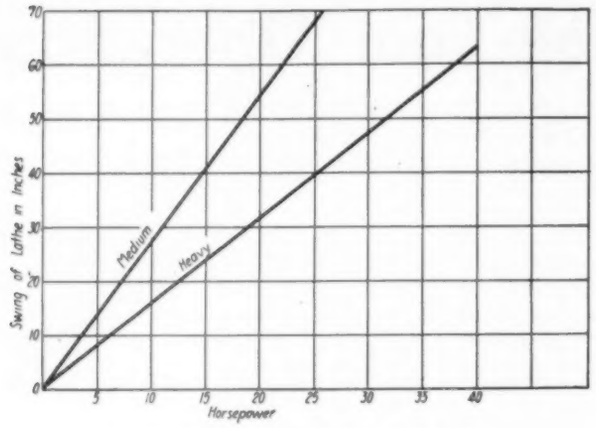


Fig. 2.—Power Required to Drive Lathes.

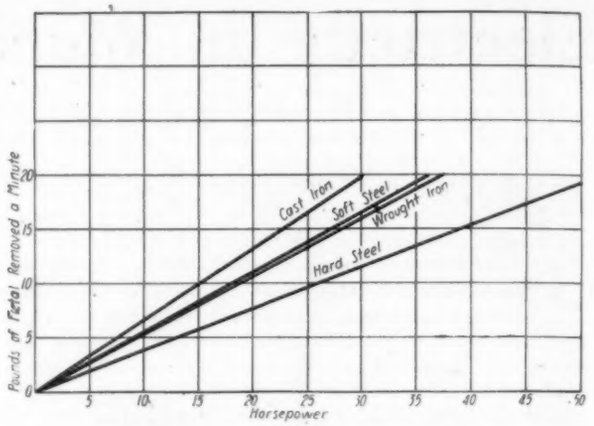


Fig. 3.—Power Required for Cutting Metal.

trolled and efficiently operated. Work can be carried between individually driven machines from any direction due to freedom from obtruding belts or shafts. The motor is installed on the machine where it is easily accessible in case of necessity, yet unexposed to dirt and flying particles of material. Brackets or supporting pads may be attached in convenient locations to provide for gearing motors direct to machines. By this means motors may be easily applied to existing tools without the necessity of a specially designed frame.

In the operation of lathes by electric motors attention is directed to the compactness of these units as well as the absence of countershafts and belts which obstruct light, waste power, and interfere with the handling of work. Controllers are operated from a handle at or near the apron, thus easily allowing instant manipulation of the tool. The elimination of slipping belts incident to group drives and the substitution of individual motors will increase the amount of material which may be removed by each tool in a given time, thus increasing the capacity of the equipment. If only on the score of expense, lost time and annoyance incident to belt renewals, plus the depreciation, wear and general uncertainty involved where mechanical methods of power transmission are employed, the change over to electric drive is amply justified. Mechanical drive demands that machines conform to fixed shaft alignments. Individual drive permits the widest latitude in machine location or relocation, at once affording the best light and aisle space. Electric motor drive commands at the will of the operator, practically unlimited power, and, no matter how much energy is required, the source is always ready and the switch convenient.

Controllers.

Controllers are designed to meet the severe service required in the control of both the constant and adjustable-speed motors as applied to individual drive when frequent stopping and starting is necessary or where the location of the controller is such as to require protection. By the use of mechanical attachments, such as chain and sprockets, gears, etc., drum controllers may be located in the most convenient position for operating, thus avoiding the necessity of leaving the work in order to start or stop the machine. Drum-type controllers are generally used on motors up to 35 horsepower with an electromotive force of 230 volts. For motors of larger rating it is not considered practicable to use direct-acting controllers, and contactor panels with small master controllers are generally substituted. Controllers for adjustable-speed motors are so arranged that when turned off the field current is reduced so that no damage will be done to the motor field if left continuously upon the line. Controllers have been developed especially for governing motors used for raising and lowering the cross rails on planers and boring mills, and for operating lathe carriages, etc. A spring return to the "off" position prevents the operator from leaving his machine while the motor is in operation. These controllers are supplied for either hand or rope operation. Rheostats are designed for the starting duty of direct-current, constant-speed motors, and the rheostat and a circuit-breaker are frequently combined on the same panel, which simplifies the wiring and makes a neater installation. These controllers are designed for starting duty with group drive and similar applications where starting service is infrequent. Automatic controllers are made so that the motor driving a machine may be started or stopped by means of push buttons located at various convenient points. This arrangement not only saves time and labor but frequently is the means of saving fatal consequences in case of an accident.

For starting constant-speed, polyphase motors above five horsepower a starting compensator is provided to reduce the current demand on the line. Below 7.5 horsepower, polyphase motors are generally thrown directly on the line. An assort-

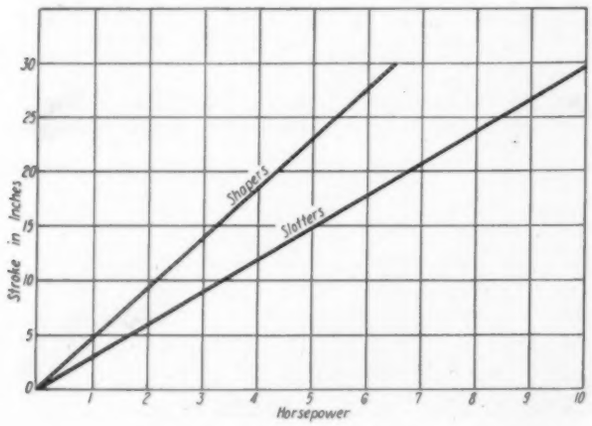


Fig. 4.—Power Required to Drive Shapers and Slotters.

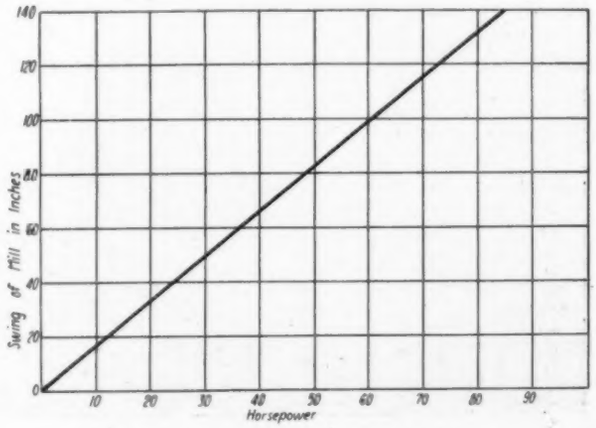


Fig. 5.—Power Required to Drive Boring Mill.

ment of controllers is also designed for the control of variable-speed, polyphase induction motors.

Selection of Motors.

It is important that motors purchased be not only of high efficiency but of the proper size and winding to perform the

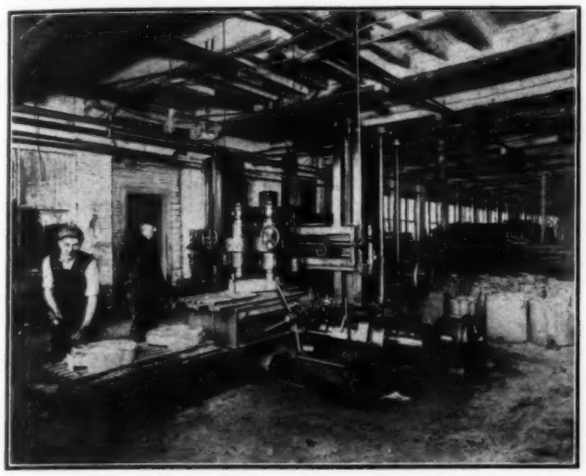


Fig. 6.—Motor-Driven Boring Machines.

work in hand. While it is well always to purchase a motor having a small margin of power above the actual requirements, it is not desirable to use a motor much larger than needed, unless the load is to be increased soon. The best motors are designed so that they have the maximum efficiency for continuous operation at their normal rated output, and it should be the aim to subdivide the grouping of the machinery so that the motors in use, so far as possible, operate at their maximum output when in use.

In equipping a shop a number of machines will be used but intermittently. As a rule, it is not desirable to drive such machines from motors that are operating machines continuously, for, if this is done, then during certain periods, when the intermittently-operated machines are idle, the motor will be operating at partial load and at a point much below its highest efficiency. Only during a portion of the time, when the machines intermittently used are at work, will the motor be carrying its full load and doing its work in the most economical manner. In cases where a mixed load must be carried it is desirable to split the drive and use two or more motors, one for driving the continuously operated machines and one for driving the intermittently operated machines. In this manner each motor may be operated at its best efficiency, when operating at all, and a large saving in energy bills will be the result.

Many times the conditions are such that some machines are operated continuously ten hours a day and in the same shop there may be other machines which are operated one or two hours a day. The work may generally be so arranged that the machines necessitating intermittent operation can be used without throwing them all on at the same time. Under these conditions a comparatively small motor running at high efficiency may be used for all of these machines, through the intermediary of a short length of shafting. The choice of the type of motor to be used is also largely influenced by the work to be performed. Shunt-wound motors have good inherent regulation under various fluctuations of load after they once are brought up to speed, and if the machines to be operated are well balanced, are doing reasonably uniform work, and have no heavy moving parts, the inertia of which must be overcome in bringing them up to speed, shunt-wound motors are applicable.

The shunt-wound motor, when used to bring a very heavy piece of machinery into motion quickly, where large inertia must be overcome, labors under a great disadvantage, inasmuch as it cannot exert such an abnormal starting torque as can the compound-wound motor. In cases of those machines which operate under sudden and intermittent loads, or which have parts whose inertia requires the expenditure of much energy to overcome, compound-wound motors are best suited to the work, although their speed regulation is not as good as that of shunt-wound motors.

Conditions under which machine tools operate are so varied that it is impossible to represent by empirical formulas the exact horsepower which should be used, but an approximate figure can be reached. Broadly speaking, machine tools may be divided into two classes, those with direct rotary motion of either the work or the tool, and those with a reciprocating motion of either work or tool. The first class comprises lathes, boring mills, milling machines, drill presses, etc., while the second class includes planers, shapers, slotters and machines of similar character. The adjustable-speed motor has decided advantages in the way of economical production when applied to machine tools. With the old method of speed variation, that is, by means of cone pulleys or nests of gears, only coarse increments in speed are obtainable, which invariably means that the machine cannot be worked to the limit of its producing capacity.

With the new high-speed steels, necessitating greater pulling power from belts and increased strength in the gears, reasonably fine increments in speed are almost impossible, due to the great length of the cone pulleys or the abnormally large size of the change gears required to obtain the necessary range of speed variation. The adjustable speed motor actually decreases the cost of machine tools by eliminating the bulky and expensive speed-change devices.

In general, motors to be used for lathes, boring mills, drill presses, etc., should be of the shunt-wound, adjustable-speed type with good inherent speed regulation. Machines having a reciprocating motion are from their nature less productive than machines having a purely rotary motion of either cutter or work. For this reason it is especially important that machines having a reciprocating motion be run to the limit of their capacity. This of course requires an adjustable-speed motor similar to the motor described in connection with rotary motion machines, except in cases of machines having a reciprocating motion when the compound-wound motor should invariably be

Fig. 7.—A Two-Horsepower Direct-Current Motor Driving Shaper.

used. The compound-wound motor is useful in that at the instant of reversal of the machine tool, when the torque required of the motor increases very considerably above the normal, the compound winding assists materially in holding back the inrush of current within reasonable limits, which may be further improved by the use of a flywheel. The polyphase, constant-speed induction motor has speed characteristics similar to those of a shunt-wound motor and is applicable to the operation of machines operating at a constant speed and for group driving. As central-station distribution systems are now largely alter-

nating current, the usual practice is to install a motor-generator set to furnish energy to the direct-current motors.

Load-Factors.

Load-factor is defined in several different ways, but its general significance is the same in all cases; that is, it is a measure of the ratio of the average consumption of an installation to the maximum. The average is usually taken to be the total energy in kilowatt-hours divided by the time of operation, while there are several ways of fixing the maximum. It may be taken as the sum of the full-load ratings of all apparatus connected to the lines; or it may be taken as the actual demand registered by a maximum-demand indicator; or it may be determined by the maximum load sustained for a given time as shown by a watt-hour meter. From a large number of tests it has been found that the average kilowatt-hour consumption per month per connected horsepower for individually driven machine tools is 42.8 and the load-factor 16.5 per cent. For group-driving of machine tools a number of tests showed the average kilowatt-hour consumption per horsepower per month to be 89.7 and the load-factor to be 34.4 per cent. Load-factor here signifies the ratio of the actual energy used in kilowatt-hours to the maximum kilowatt-hours which would be used were the motors to run at full load for 350 hours per month.

It will be seen that there is a considerable difference in favor of the individual drive, as shown in the percentage of the average load to the connected motor load; that is, load-factor. This difference, however, does not indicate the exact difference in consumption of energy, since the rating of a group-drive motor installation is usually only about from 75 to 80 per cent of that of an individual motor drive. The latter, however, is more economical in many instances, as the saving usually effected is largely in excess of the interest and depreciation charges on the extra cost of installing the additional motors required.

Power Requirements of Machine Tools.

The power used for cutting metals is directly proportional to the weight of the material removed in a unit of time. The chart (Fig. 3) is based on the number of pounds of metal per minute and gives average results. From a test of a 42-inch engine lathe cutting soft steel with a feed of one-sixteenth of an inch and a depth of cut of one-quarter inch, with a cutting

Fig. 8.—Individually Driven Tools in Machine Shop.—Three-Horsepower Motor Driving Milling Machine in Foreground.

speed of 44 feet a minute, the weight of metal removed per minute was 2.33 pounds with an actual horsepower consumption of 3.8. Another test on the same lathe and same material, with a feed of one-sixteenth of an inch, but with a cut of only one-eighth inch, and a cutting speed the same as in first test the actual horsepower required was 2.6. It will be seen that one test is a little below the chart figures and the other test a little above, as the weight of the metal removed a minute was, respectively, 2.33 and 1.17 pounds.

Charts (Figs. 2, 5, 4 and 9) show the approximate power requirements of lathes, boring mills, shapers and slotters

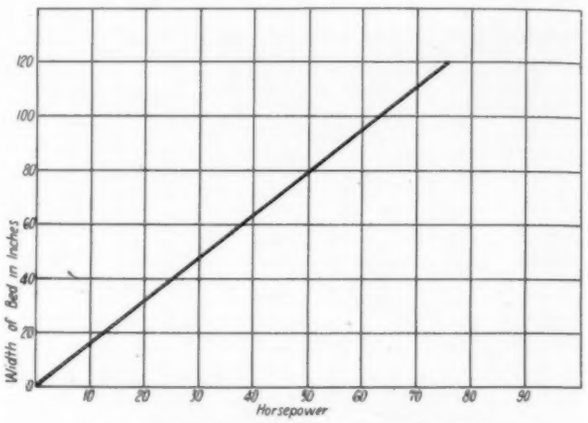


Fig. 9.—Power Required to Drive Planers.

and planers, respectively. These charts have been based on empirical formulas checked up and averaged with tests and are figured for one cutting tool of high-speed steel. At the present time the cutting speed and the amount of material removed a minute is far in excess of that of a few years ago, consequently the power requirements are greater than with the older methods of operation.

A Plea to Give Publicity to Research and Scientific Data.

The sub-committee on Engineering of the general Committee on Research of the American Association for the Advancement of Science, composed of A. E. Kennelly, J. W. Richards, A. Saureur, A. N. Talbot, and C. C. Thomas, has issued the following appeal to the industrial-research laboratories of the country.

"In the course of work done in the numerous industrial laboratories of America, many physical and commercial constants and data of great scientific interest and value are doubtless arrived at, and which may, for a certain period of time, constitute an asset of considerable commercial value to the particular corporations in question. During this period, everyone recognizes the proprietary right of the industrial laboratories to the retention of this information.

"A time frequently arrives, however, when such scientific information loses its commercial value (often by being duplicated in other laboratories), and just at this point it is desired to impress upon the industries their obligation to enrich scientific literature with such facts and data, which might otherwise be lost or forgotten.

"Some of our industries have been reproached with the suspicion of acting as sponges, in that they absorb an immense amount of useful information from scientific literature without giving any return in kind. This suspicion would be entirely removed if, from time to time, scientific information which has ceased to be of commercial value were contributed by them to its appropriate channel and thus became available to all scientific workers throughout the world.

"If any doubt exists as to the appropriate channel for the publication of such scientific data and communications, the secretary of the American Association for the Advancement of Science, Dr. J. McKeen Cattell, Garrison-on-Hudson, New York, will be glad to act as intermediary and to forward such communications to the proper scientific body."

Some Causes for Municipal Ownership

By GLENN MARSTON

This is the fifth and last of a series of articles discussing the more important causes of municipal-ownership agitations and presenting comprehensive suggestions for preventing them. The present discussion deals with the ever-prevalent anti-corporation sentiment and also points out the dangers confronting combination companies. Previous articles treated of central-station rates, politics, indifference to the public, and poor service.

ASIDE from the more frequent causes of municipal-ownership agitation—rates, politics, indifference, and poor service—there are other causes which are the result generally of local conditions. There are also causes which are far less frequent than is generally believed. Among these are socialism and anti-corporation sentiment.

In all my experience with municipal-ownership agitations, I know of only one where socialism was the basic cause of the agitation. After an agitation is started the socialists naturally get on the bandwagon, but they are seldom strong enough in themselves to start trouble alone. As a basic cause of municipal-ownership agitations socialism has been very much over-rated, and has sometimes been used by company officials as a convenient excuse, when the blame for an agitation would have fallen on their own shoulders, where perhaps it properly belonged. In the one instance, where socialism was a real cause, the municipal ownership scheme was overwhelmingly voted down.

One other place had a strong socialist organization, and socialism was an important factor in getting the question before the voters, but the company, although a very progressive one in most respects, had overlooked the fact that its rate schedule appeared complex to many people and had made little if any effort to enlighten the public. The beginning of the municipal-ownership agitation in this case was a public desire for equalizations in the rates. When the company began to explain its rates the thought of municipal ownership came up in connection with the coincidence that the street-lighting contract was about to expire. The socialists took up the question enthusiastically, and their discussion probably was the direct cause of calling the election, but the real cause of the agitation was public misunderstanding as to rates.

In cities where companies are living up to the standard which the public today has a right to expect, the socialists believe in municipal ownership just as much as they do anywhere, but they cannot interest the people in their ideas, because of general satisfaction with conditions as they exist. The public sees no use in making a change unless that change is for the purpose of remedying some real or imaginary evil. If any evidence on this contention is needed it is furnished by the one purely socialistic campaign for municipal ownership where the campaigners got one-fifth of the total vote cast.

Anti-Corporation Sentiment Not a Cause of Municipal Ownership.

Anti-corporation sentiment is generally believed to be a frequent case of municipal-ownership agitations. Generally the opposite is true. Anti-corporation sentiment is a result of agitation. The desire for a new electric plant nearly always arises from a desire to correct some shortcoming of the existing plant, and it is not considered a shortcoming that it happens to be a corporation. When a corporation has failed in its expected duties toward the public it is not surprising that there should be feeling against it, and some resentment, because no other method of securing that corporation's products, save from the corporation itself, is possible. No individual wants to feel that he is dependent on any single source of supply for any commodity, any more than a corporation would feel like being dependent on a single coal dealer, for example. If we buy milk from one man and it is unsatisfactory our first impulse is to try another milkman, and we do not feel competent to insure good milk for ourselves if we find there is no other milkman to go to. Our remedy is either to buy a cow, or get our friends to join us in organizing an independent dairy, or to invoke the public authority.

When it comes to electricity the first two methods are impracticable, on account of the capital necessary. We can invoke the public authority in two ways: We can ask the authorities to make the electric company behave, or we can ask the authorities to provide community capital to do what we cannot do ourselves.

The first of these two methods is all right if we have complete confidence in our public officials. But if they listen to us will they not also listen to the corporation who can employ skilled debaters, while we must depend on our own poor powers of persuasion? We feel that we will not get a fair shake. The thing to do is to build a new plant with city money. Then we will be in no danger from the corporation which refuses to let us have the discount three days after our bill should have been paid. We will build a plant, and there shall be no discounts on bills. Then we can pay when we feel like it, without being penalized eight or ten cents for our carelessness.

That is the reasoning of the man who is generally guilty of anti-corporation sentiment. He has to have a definite grievance himself before he becomes enrolled among the anti-corporation crowd. He fails to see the ludicrous side of spending $100,000 to save himself a few cents a month. He feels that the $100,000 is some other man's money, anyhow, while the pennies are most definitely his own.

Thus anti-corporation sentiment is the result of misunderstandings regarding rates, service, or other things, and is not a cause of those misunderstandings. The correcting of anti-corporation sentiment cannot come through fine words—it must come through action first, and then the words to make clear to the public what action has been taken. The causes of that sentiment must be sought out and remedied, then the sentiment will, after the public has been shown a satisfactory state of affairs, disappear.

Threatened Competition a Cause.

Municipal-ownership agitations have sometimes been the result of threatened competition on the part of a new company, and sometimes municipal ownership has been given up, because the longed-for relief has been promised by a new private company.

If competition by a new company is sought in a field already occupied, the first step of the new company is to bring public opinion to a state of dissatisfaction with the existing company. Much of this dissatisfaction may be unjustified, but the existing company is compelled to go to great trouble and expense in protecting itself. Sometimes the city officials are convinced by their constituents that if competition is to be permitted it should be by a municipal plant on which all the people can vote, and in the management of which they will have a voice, instead of being realized through another company which may consolidate with the old one as soon as it attains to a proper nuisance value. There are occasions when the general public wants neither municipal nor private competition, and where their only way of showing it is through voting on a municipal plant.

On the other hand, I have seen several instances where the demand for municipal ownership as a remedial measure was very much weakened by the application of a new company for a franchise, offering to accomplish the reforms which the public desired, and at no public expense. In such cases the dissatisfaction with the existing company is generally well founded, and if the company has a real desire to meet the public wishes a hurried agitation for a municipal plant is much more dangerous than the threatened entrance of a new company. When the new company comes in the negotiations usually are somewhat protracted, owing to the fact that the new investors want to protect their money to the fullest degree, and a conscientious company already in the field can sometimes improve its standing with the people during such negotiations to such an extent as to discourage completely the entrance of the new utility company.

Occasionally the people of a community are narrow enough to feel that a company controlled by outside capital is a detriment to local interests, and a movement is put on foot to go into municipal ownership, through purchasing the foreign owned company. When this type of agitation comes up the company has to show very clearly what the community would be like without foreign capital. Another type of agitation against foreign control is that involved when a small place is served by a company doing business and having its headquarters in a neighboring larger city. It is very hard to convince the smaller community that it is not being discriminated against. In such cases the company is under the constant necessity of keeping the smaller community fully informed of all the efforts it is making to advance civic interests, not to the detriment of any other place, but for the good of the entire territory.

The consolidation of two competing companies is used sometimes as the pretext for an agitation for municipal ownership, but such cases are usually complicated by political ambitions of individuals who think there is some personal benefit to be secured from the joining of competitors. Consolidation is effected because of the nuisance value of competition, and there is no town so small nor no body of officials so upright that some individual does not think he also has a nuisance value which can be turned to his own private benefit.

How Consolidation Sometimes Affects the Public.

In the South two companies in a medium-sized city consolidated. One was subject to purchase by the city at the expiration of certain periods. When the consolidation took place there arose an agitation for municipal ownership, to take the place of the competition which had just been eliminated, though there was no raise in rates, and service conditions began to improve at once. The agitation became very strong at one time, but the company, while put to a great deal of extra trouble by the movement, succeeded in creating a friendly public opinion, and the movement came to nothing. The same tactics won out for another company near the Canadian border, which would indicate that there should not be too much importance laid on the widely prevalent idea that people of different communities require widely different methods of handling. The old theory of physics, that like reactions produce like results, hold pretty well as to human nature also.

Differences in the action of people are due to differences in the conditions which cause action. In many cases I am told "our community is different," only to find that the difference lies in the attitude of the company, and not in the people at all. When the company's attitude is changed to conform with that of other successful companies, the public attitude will be found to have changed as well.

In combination companies handling light, power and railway business, public impatience with one department often results in vengeance being taken on some other department. Failure to make street-railway extensions has caused agitations for municipal ownership, merely as a punitive measure. It is the old story of the community feeling helpless to enforce its desires in a regular manner.

The Problem of Combination Companies.

One city where I was called in had been clamoring for several years over the fact that street-car fares in interurban districts were too high. The fact was that there had been two interurban lines from one place to another. Competition had brought fares too low, with a resultant consolidation. Even after consolidation an effort was made to hold the fares at the competitive figure, but a receivership followed, and the new management raised the fares after another trial at the old figures. No explanation was ever offered as to the reasons behind the increase. Public indignation ran high, and the people got the idea that the company was trying to throttle the growth of the smaller place. When the rates for electric light were questioned the people immediately began to compare the trolley raise with the electric rates, and when municipal ownership was suggested the people voted for it, in order to convince the company of its shortsightedness in raising fares. Argument that the municipal plant would not reduce trolley fares was useless—the people were certain that the municipal plant would punish the company; so they voted for it, only to find that it would be too expensive if built.

Perhaps the most difficult type of municipal ownership agitation to combat is the kind which is based on some special condition existing in the community, such as the possession of a good or bad water power, which seems to give the city an advantage over other places which have tried municipal ownership with indifferent success.

One interesting case was that of a city which owned a water-power site on the same river from which the company was getting much of its own power. The city felt it could develop its power cheaply and save money. There was practically no feeling against the company. The plans for a municipal plant made no provision for a steam auxiliary, and the company was able to show from its own records that its main water power on the same stream had been below 20 per cent of its capacity for 57 days during the preceding year. The company made no effort to belittle the value of the water power, but, instead, showed how its value to the community would be increased if it was operated in connection with other powers instead of independently. A good offer was made for the lease of the power, and it was developed by the company in connection with its other powers.

It is not often that a single basic cause is enough to start a serious agitation for municipal ownership. Usually two or more of the causes which have been outlined in this series of articles combine to cause an agitation. Generally speaking, therefore, a company still has time to protect itself when one cause of public dissatisfaction manifests itself. The earlier preventative measures are taken the safer a company is, and, of course, the safest company of all is the one which never ceases to keep the public fully informed of its activities in behalf of general community welfare.

New Branch Store of Boston Edison Company.

Early in February the Edison Electric Illuminating Company of Boston, will open a new branch store in the high-class residential suburb of Winchester. This will be located at 535 Main Street, and will be one of the largest of the district stores in point of floor area. Heretofore the town has been served from the Arlington store on the one side and the Woburn store on the other. The community is regarded as important enough to have a local suboffice and appliance shop of its own.

The local representative in charge has not yet been selected.

Feeder Sizes and Connected Load

Data and Graphical Diagrams of Demand-Factors Found to Exist in Typical Classes of Light and Power Installations Served from Central-Station Lines in the City of Chicago

VALUABLE data on demand-factors were presented in an address made on January 23 by H. B. Gear, engineer of distribution, Commonwealth Edison Company, Chicago, before the Toledo convention of the Western Association of Electrical Inspectors. The question came up in connection with a symposium on "The Relation of Feeder Sizes to Connected Load," in the discussion of which views were expressed by a representative electrical inspector, an electrical engineer, an electrical contractor and a central-station man. Mr. Gear made the address explaining the central station's attitude on this subject.

Mr. Gear said he was agreed with the views expressed by several speakers, who urged the importance of getting mains of sufficient size to take care of a reasonable amount of growth and especially to take care of heating appliances and other electrical devices which the ordinary householder nowadays wants to use after he gets his house wired. This is true as regards the average small installations. However, the phase of this question which appeals to the central-station engineer mostly is the situation which develops in the larger installations. It is not at all an uncommon thing to hang a bank of transformers adjusted to the size of demand which is expected from an industrial installation and run a set of service wires of say, No. 0000 and connect them to outlets brought out in accordance with the Code regulations which are twice as large as the service leads necessary to carry the transformer bank. This is in spite of the fact that transformers are selected more often with some reserve capacity than on the basis of overloading them, because it is a central-station experience that additional loads do come on in most of these factories in the course of a year or two, and it is the usual thing to provide the next size larger in transformers in service capacity rather than the next size smaller. However, in spite of this, there is still considerable to be said in favor of the possibility of using a demand-factor as suggested in the report of the induction motor committee in determining the size of large motor mains. (See page 202 of this issue.)

In Chicago, the Commonwealth Edison Company has for many years sold electricity on the demand basis, which requires that demand meters be installed for the measurement of the individual customer's demand in all cases on power installations for direct current where the connected load is 1.5 horsepower or larger and for alternating current 10 horsepower or larger, and on all lighting installations of over 1.5 kilowatts. It has been possible, therefore, to accumulate a large amount of data with regard to the demand of light and power installations, and to judge in regard to these things more intelligently than the inspector or the contractor or manufacturer or anybody else can in regard to demand-factors.

Mr. Gear showed a few slides giving the results of some of these investigations in a few typical installations, not enough, however, from which to draw averages because it was not possible in the time available to compile data for any large number in the form in which it will be used. Data are given on a few typical installations so as to give an idea of what the situation is.

The charts were prepared in two ways, the first group showing the demands of various kinds of installations for each month in the year, expressed as a percentage of the connected load. The scale is in the per cent demand, and the size of the installation is indicated in the lettering.

Fig. 1 represents department stores, four of the largest ones in Chicago. Curve *A* is one of the better grades of stores, with 1,321 kilowatts installed in light and power, including electric elevators and some ventilating equipment, but largely lighting. The demand is fairly constant throughout, but increases during the fall months. In all of these department stores, less than one-half of the installation is used at any one time during the year except during the Christmas season, when it goes a little above 50 per cent. Curve *B*, showing a 1,770-kilowatt installation is the latest equipped store and has rather more of large power equipment for cash carriers and for ventilation, and various uses of that sort, which increases the connected load and somewhat reduces the percentage so that in that installation it runs about 35 per cent in spring and summer and then goes up to 42 or 43 per cent in the fall. Curve *D* runs almost uniform throughout the year. That refers to Marshall Field & Company's large store.

Fig. 2 covers a group of industrial installations. The first two are structural steel plants, that is, plants for fabricating steel beams, and include beam saws, punches, shears and large machinery of that sort, which requires heavy motors to do very heavy duty. Therefore, there is a very large connected load for a given demand. Curve *B* runs as low as 10 per cent of the connected load and does not vary very much in the year. Curve *A* is very much higher and requires 20 to

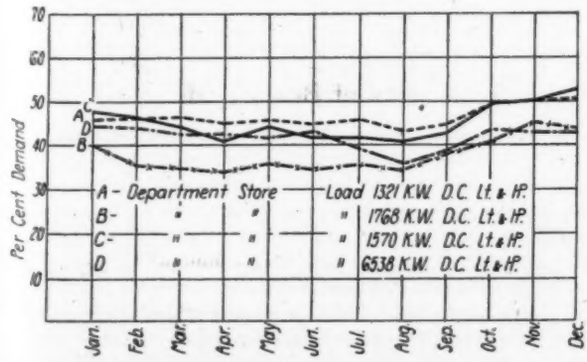


Fig. 1.—Typical Demand Curves of Large Department Stores Having Both Power and Lighting Loads.

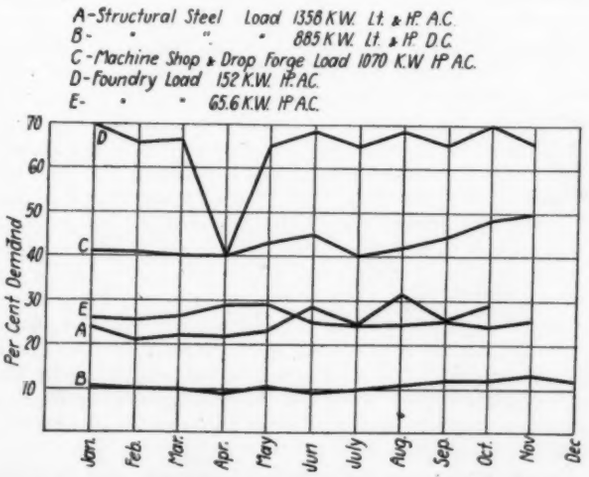


Fig. 2.—Demand Curves of Industrial Plants With Power Load Chiefly.

28 per cent. The variations from month to month are immaterial. Curve *C* refers to a machine shop and drop-forge plant with about 1,000-kilowatt connected load, and represents a fairly steady load throughout the year. It shows an increase in the latter part of the year; some of this increase in the latter part of 1916 is due, no doubt, to the general increase in manufacturing activity during the latter part of

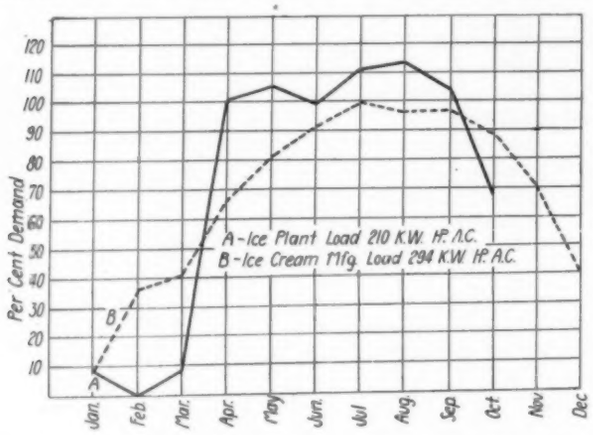


Fig. 3.—Demand Curves of Ice and Ice-Cream Plants.

last year, which required running the plant up to full capacity. These figures consequently represent as extreme conditions as would ordinarily be found in any plants.

The last two curves, *D* and *E*, of Fig. 2, are foundry installations and these are quite different in character. *D* runs up very high to about 70 per cent of the connected load. It is a 152-kilowatt installation, whereas that represented by *E* is only 65.6 kilowatts. The probabilities are that the *E* installation was using somewhat larger motors for the work. That is one factor which Mr. Gear finds must be taken into consideration in determining demand-factors. The consulting engineer or the manufacturer's electrician may have different ideas as to what reserve capacity it is desirable to provide. So in some cases he finds very high connected loads in proportion to the demand, because of the extreme liberality in the selection of the size of the motors, and in other cases there is a disposition to run the motors at full load or slight overload, and thus run up the demands.

Fig. 3 represents a very interesting example, showing the development in Chicago during the last three years in the manufacture of ice from raw water, that is, without any distilling plant, which has been a practical thing since 1912. There are now 20 plants making ice with electrical power in Chicago. These run 110 per cent demand-factor in one case, for the ice plant itself. The dotted line represents the ice-cream manufactory. The difference between the ice plant and the ice-cream plant is that the latter produces refrigeration for the purpose of making ice cream with the cans in the brine, whereas the ice plant refrigerates the brine for the purpose of freezing water. The demand of the ice-cream manufacturer runs a little more uniform throughout the year than that of the manufacturer of ice. The ice manufacturer does not start until March or really April. He is just getting ready in March. He runs from April through to October, and then his demands are low for the rest of the year. While the last two months are not shown on that curve, the curve would run down to where it is in the early months of the year, if it were shown. There are one or two of these factories which are owned by the large manufacturers, which run the year around, they being located in residence districts where ice is used in apartments in the winter just as it is in the summer.

The reason for the demand-factor being so high in these installations is this: The ice business is a very highly competitive business. The engineers interested in the design of the apparatus are highly skilled people who knew the requirements of the compressors from measurements of steam engines, quite accurately in advance, and they therefore selected the motors to be nearly equal to the load which they knew was going to be on the compressors. Furthermore, the motors used are 150, 200 and 250-horsepower motors, with a very few small motors for minor apparatus. The reason they run overloaded in July and August is that those are the two heavy months of the year. This does not necessarily mean that they run this way every day in the month, but in humid weather the evaporative power of the ammonia is decreased and it is necessary to run the motors at a higher duty and make them compress a little higher to produce the same amount of refrigeration. These overloads come on days when temperature and humidity are high.

Fig. 4 represents a group of garages. There had been the impression, in the case of a garage having a great many charging outfits, that the size of the mains required to supply the theoretical load to each one of these charging plugs was excessive, so a few typical installations were studied. It is necessary to discriminate between the *A*, *B* and *C* curves on this chart and the *D* curve. The latter represents the real situation, since it represents a garage taking energy from a direct-current system without any intermediate converting apparatus and, therefore, represents the real load upon the charging outfits and the actual demands of the mains going into the buildings. That curve represents 55 per cent demand-factor in the early part of the year and runs up to 82 per cent in the latter part of the year. It is a garage of the American Express Company, whose business had increased in the latter part of the year so that it was necessary to add a few more plugs. It can be considered, however, for that sort of a system, i. e., commercial vehicles, that the demand-factor is somewhere around 75 per cent of the connected load.

The other installations are garages taking power from the alternating-current system through a motor-generator, the connected load being taken as the capacity of the motor driving the generator. In that sort of an installation the purchaser of the motor-generator has already taken account of his demand-factor in the selection of the size of his machine for the number of outlets he is going to have. This

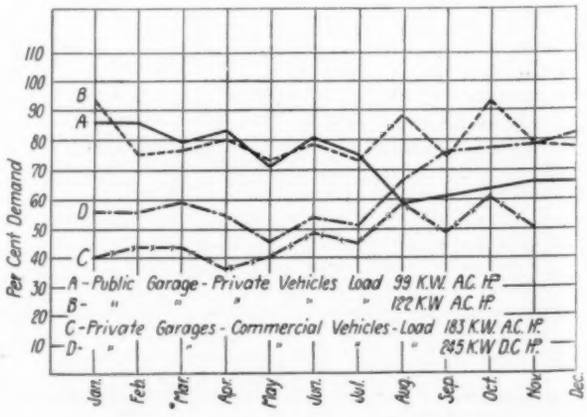


Fig. 4.—Demand Curves of Typical Electric Garages.

gives the result, therefore, that one would naturally expect, that of the demand being around 85 or 90 per cent of the connected load.

In order to show this in a larger number of classes and not to show the variations by months, but to take the highest month in the year, these data were plotted in a different form, as indicated by the remaining charts. In the first column of Fig. 5 is given the average of four department stores, excluding Marshall Field & Company, so that all

would be about the same. These stores average 1,300 kilowatts connected load and they average a demand of 44 per cent of the connected load. For purposes of arriving at the highest demand-factor in a group we will take the top line of the shaded portion, which represents the highest individual demand-factor in the group, and not the lower line in the shaded portion, which represents the average demand-factor for the group.

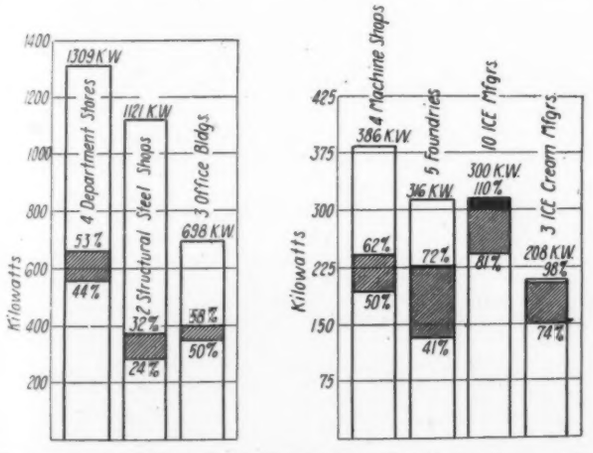
The second column (Fig. 5) represents the two structural-steel plants mentioned previously, with an average kilowatt load of about 1,100, and an average demand-factor of 24 per cent.

The third column represents three large office buildings. The 58 per cent office building in this chart is the Insurance Exchange. In that building there are nearly twice as many cables going from the service board as there are coming to it from the outside. The service going into the building is always much less than the total capacity of the mains going out.

Fig. 6 covers much smaller installations. The first column represents miscellaneous machine shops where there are a certain number of machines idle all the time due to set-up and so forth, and these will show a demand of from 50 to 62 per cent.

The next column represents a group of foundries and these run from 41 to 72 per cent demand-factor. This is a matter largely of blowers and the capacity of the motors selected for the work and the load that happens to be on the blowers and tumblers and machines of that sort. Tumblers give a rather steady load and are apt to run into rather high demand-factors.

The next column is the net result of the data on ice plants. The demand is very high. The highest one was the first one built and at that time the designers did not have enough experience to know just what sizes of motors to get. On the warm days they have been overloading the motors about 35 per cent. The next column represents ice-cream



Figs. 5 and 6.—Graphical Representation of Ratio of Demand to Connected Load in Several Classes of Central-Station Customers.

manufacturers, which run about 98 per cent of the connected load as the maximum demand-factor.

Fig. 7 relates to installations below 65 kilowatts. The first is a group of six department stores in outlying parts of the city, each three or four stories high and serving the people of the immediate vicinity. These give approximately the same demand as in the large department stores.

In the next column are represented eight typical machine shops, with an average connected load of 52 kilowatts and a 44 per cent demand-factor.

The next column indicates four moving-picture shows, with an average of 57 kilowatts as the connected load and a 78 per cent maximum demand-factor. Then three paper-box manufacturers, 28.5 kilowatts load and 75 per cent high demand-factor.

The next columns represent apartments buildings, of which Mr. Gear has made a very extensive study. In some of the larger buildings the size of the mains amounts to a

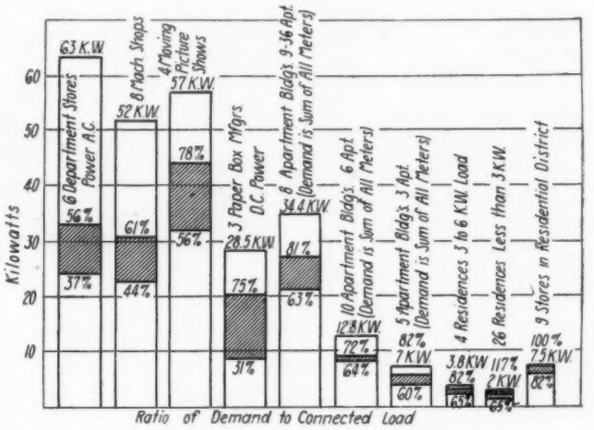


Fig. 7.—Graphical Representation of Ratio of Demand to Connected Load in Other Classes of Central-Station Customers.

considerable excess. Here are eight apartment buildings having from 9 to 36 apartments each, with an average connected load of 34.4 kilowatts and with the highest demand 81 per cent and the average about 63 per cent. Then there are 10 smaller ones, six-apartment buildings, with an average connected load of 12.8 kilowatts. The highest demand is 72 per cent and the average 64 per cent of the connected load. Next are represented five three-apartment buildings, with an average connected load of seven kilowatts, with the highest demand 82 per cent and the average demand 60 per cent.

Four residences follow with an average connected load of 3.8 kilowatts, the highest demand-factor being 82 per cent and the average 65 per cent of the connected load. Then are shown 26 residences of less than three kilowatts, where the highest demand-factor is 117 per cent and the average 65 per cent, with an average connected load of two kilowatts. These latter calculations did not take into account the heating appliances, but counted the lamps. The 117 per cent means that there were not taken into account the heating appliances in getting that two-kilowatt connected load. This does not mean that the main is overloaded, but it does mean that it would not be safe to cut down the mains in these small installations, because the margin is so small; at the same time it would take away the opportunity from the consumer of using the appliances he wants to use.

The last column represents nine small stores in a residential district, with an average connected load of 7.5 kilowatts. The highest demand is 100 per cent, while the average is 82 per cent.

Such studies as those shown in the accompanying charts are worthy of being continued for all classes of customers. As the number of installations considered increases, the value of the average demand-factor determined is, of course, enhanced.

Texas Company Promotes Range Sales.

The Texas Power & Light Company, of Dallas, is waging an active campaign for the sale and use of electric ranges by the people whom its extensive distribution lines serve. The company expects to sell about 2,000 electric ranges during the current year.

Modern Street Lighting in a Small City

New Installation in Roundup, Mont., Typical of Modern Practice—Ingenious Construction Methods Used, Which Effected Considerable Savings

THE street lighting system recently installed in the City of Roundup, Mont., is typical of practice which is becoming widely used in small communities. Roundup is a modern city, in every respect, having a population of 3,500, and possessing an extremely progressive commercial club.

The street-lighting system is a series-incandescent system, the business section containing 51 five-light cluster posts, and the residential section containing 207 single-light posts. The 51 five-light posts are located on Main Street from Fourth Avenue to Railway Avenue, on Railway Avenue from Main Street to Second Street East, and on Second Street East, from Railway Avenue to Second Avenue. Each of the five light posts contain one 100-candlepower, 6.6-ampere Mazda lamp, and four 60-candlepower, 6.6-ampere Mazda lamps. The 100-candlepower lamp is located in the center of the cluster, at the top of the post. The side lamps are inclosed in a 12 by 6-inch Alba globe, and the top lamp in a 16 by 8-inch Alba globe. Each lamp is used with a General Electric combination porcelain series socket and cutout.

The posts in the business district are spaced 91.5 feet apart, four per block, and spaced opposite each other, the distance between posts on opposite sides of the street being 78 feet.

The posts are connected up on two separate circuits. The top lights of each post being on one circuit, and the side lights of each post on a separate circuit. The top lights are burned all night, while the side lights are turned off about 11:00 o'clock.

Each circuit consists of a single-conductor, No. 8 band steel armored cable of General Electric make. A novel feature in the installation is that the band steel on the park and suburban cable is used to ground the ornamental posts, making it unnecessary to run an extra ground wire for this purpose. The band steel is connected to the base of the ornamental post, also to the water mains where crossing same, care being taken to see that the band steel was thoroughly covered with a jute compound, after making connections to same. It is believed that there will be no trouble in using the band steel as a ground wire in this particular installation, as there should be no trouble due to electrolysis.

The city buys its power from the Roundup Electric Company, at 2,300 volts, 60 cycles, the city owning the constant-current transformer and regulator equipment.

Night View of Street Lighting in Roundup, Mont.

Union metal posts are used, painted a light gray, which gives a pleasing effect in the day time, and helps to liven up the appearance of the street.

The entire equipment in the business section was furnished and installed by the Butte Electric Supply Company of Butte, for a total amount of $8,700.

One-half of the total cost of installation, maintenance and operating expense is paid by the abutting property owners, and 50 per cent by the city.

The residential lighting system, as previously stated, consists of 207 single-lamp posts, located on First, Second and Third Streets, West, from First Avenue to Seventh Avenue, inclusive, and on First to Seventh Avenue, inclusive, from Main Street to Fourth Street, West.

Each post contains one 100-candlepower, 6.6-ampere Mazda lamp, enclosed in a 16 by 8-inch Alba globe, and used with a General Electric combination porcelain series socket and cut-outs.

The posts are spaced 122 feet apart, being staggered on opposite sides. The distance between the line of posts on opposite sides of the street is 35 feet. This system is divided into three circuits, each containing approximately the same number of lamps.

Each circuit of the system is supplied with constant current from a separate, constant-current transformer, regulator and control equipment of General Electric manufacture. Each circuit consists of a No. 6, single-conductor, band-steel-armored cable of General Electric make. This being a staggered system, the cable was run diagonally across the street from a post on one side to the nearest post on the opposite side of the street, then back across the street, to the nearest post on the opposite side, and so on, instead of running the cable up one side of the street, and down the other side. By this arrangement, approximately 42 per cent was saved in the total length of cable required. When using this arrangement of installing cable, conduit should be used to run same in, if it is contemplated on paving the street at a later date, so as to make any necessary repairing easier. Union metal posts were also used in this district. This equipment, too, was furnished by the Butte Electric Supply Company, of Butte, the total cost, including installation being $19,000. The abutting property owners paid 75 per cent of the total cost of installation, maintenance and operation, and the city the remaining 25 per cent.

Claude Renshaw, municipal engineer, Roundup, in laying out this system wished it flexible, so that at a later date the system could be extended, and additional posts added, or higher candlepower lamps used in the present posts, without making any changes in the system whatsoever. The constant-current equipment was installed to provide capacity for future extensions which are contemplated.

Washing-Machine Manufacturers Convene.

The American Washing Machine Manufacturers' Association held its first annual meeting at the Hotel Sherman, Chicago, on January 24 and 25. In January, 1915, a small group of washing-machine manufacturers held the first meeting in Chicago and decided that they would form a permanent organization for the purpose of creating better trade conditions and to take advantage of the constructive opportunities now being offered to American industries by the Federal Trade Commission. Since that first meeting the number of members has increased until the manufacturers in this association produce approximately three-quarters of all of the washing machines made in this country.

At the annual meeting S. T. White, of the White Lily Manufacturing Company, Davenport, Iowa, was re-elected president; J. D. A. Johnson, of the Michigan Washing Machine Company, Muskegon, Mich., first vice-president; H. L. Barker, of the 1900 Washer Company, Binghamton, N. Y., second vice-president; F. H. Bergman, of the One Minute Manufacturing Company, Newton, Iowa, third vice-president; W. H. Voss, of the Voss Bros. Manufacturing Company, Davenport, Iowa, treasurer, and Raymond Marsh, of Chicago, secretary.

The association work consists of stabilizing conditions in the industry and establishing standards of manufacture to benefit everyone who uses, sells or makes a washing machine. Considerable attention has been given, during the past year, to the problem of efficient distribution, and a co-operative national publicity campaign to advertise the need of washing machines in the home is now receiving serious consideration. The members of the association are inclined to believe that the average housewife does not realize the possibilities of the household washing machine as a practical labor and time-saving device.

Group at Indiana New-Business Meeting

About 75 representatives of Indiana central-station companies were in attendance at the meeting of the New-Business Committee of the Indiana Electric Light Association, which was held in Muncie, Ind., January 23. Many important topics were discussed, chief of which was a plan for a state-wide electric-range campaign which is to be inaugurated early in the spring. The Muncie Electric Light Company acted in the capacity of host during the meeting and at a banquet which was held during the day. The group view shown herewith was taken during the noon recess on the steps of the Carnegie Library. A mascot was appropriated just before the photograph was taken.

COMMERCIAL PRACTICE

New-Business Methods, Policies, Rates and Kindred Central-Station Matters for the Man Engaged in Selling Electricity

COMMERCIAL ACTIVITIES OF PUEBLO COMPANY.

Great Extension of Industrial and Rural Business—Considerable New Work to Be Undertaken.

Electricity has been and is continuing to be one of the big factors in the development of the Arkansas Valley, in Colorado. Farmers are increasing their use of electricity for lighting and power purposes, while small rural industrial plants run their machinery with electric motors.

Pumping plants for irrigation, stock and household purposes are supplanting the irrigation ditch, the windmill and the old hand pump. The increased amount of power sold and the extensions of transmission lines made by the Arkansas Valley Railway, Light & Power Company, of Pueblo, Colo., will give some idea of how extensive the use of electricity became during the year 1916.

From an engineering standpoint, the activities during the year 1916 were enormous and according to W. F. Raber, general manager, and E. F. Stone, superintendent of light and power, the outlook for the year 1917 is exceedingly bright with plans already being prepared for considerable construction work.

Most of the industrial plants in the city of Pueblo are using electricity for power purposes and during the year just passed, many of these plants increased their electrical capacity from 33 to 100 per cent. The increase in power sold in Pueblo during the 12 months for power purposes was 2,400 horsepower and the increase in power for lighting purposes was proportionate.

Outside of the city of Pueblo, the increase in business was correspondingly as great. The company constructed during the year a total of 69.5 miles of high-tension transmission lines. Of this amount 37.5 miles of 13,000-volt lines was constructed to serve several small towns in the Arkansas Valley and 32 miles of 22,000-volt lines was built from Canon City to Cripple Creek and Victor where because of the increased mining activity, additional power was needed. To provide this power, the company was compelled to increase the capacity of the Canon City plant and install there an additional 10,000-kilowatt generating outfit.

The company is planning on increasing the capacity of the Pueblo plant this year.

One of the reasons for the increased use of power in the rural districts is the number of pumping plants being installed for irrigation purposes and the increasing number of alfalfa mills being built. There are 36 pumping plants in the Arkansas Valley, operated by electricity, and each plant is providing water for about 100 acres of land. Pumps operated by electricity are found to be cheaper than any other power.

The company has a transmission line running from Pueblo to La Junta, a distance of 76 miles, and the farmers on each side of the line for a distance of one-half mile or more are taking advantage of the opportunity to equip their homes and other buildings with modern lighting systems, and run much of the farm machinery with electrical energy. Numerous small extensions have been made to isolated communities and only a few weeks ago, a group of 46 houses was electrified at once.

A peculiar thing concerning these 46 farmers is that they are all Italian truck farmers and the company accomplished a unique selling campaign when the power was turned on, by sending a wagon, completely equipped with all of the latest electrical appliances to demonstrate to these farmers and their families the various uses of electricity. As a result, a number of Italian women will use electric washing machines and electric irons as soon as the company can make the deliveries.

Land formerly worthless is now productive and is valued at $100 an acre—all because of electricity. Small mills in the rural communities are springing up, enabling the farmer to dispose of his products to greater advantage. Homes, churches and school houses in the country are becoming more comfortable and desirable because of electricity. Possibly the greatest blessing this great force is bestowing on the people of the farming communities of Colorado is that electrical appliances are making the farm a better place to live and is tending to keep the boys on the farm.

The Ideal Utility Manager.

The management which seems ideal for a public utility company reposes the leadership in a general manager, with departmental managers forming a cabinet or advisory staff, according to F. G. Whitney. The very title general manager infers that there must be other managers, and to these managers should be positively delegated the actual issuance of instructions and the compilation of data regulating the policy of the company.

The general manager should free himself from details to gain a clear perspective, to hold himself for quick and true decisions not influenced by one or another of his departmental details. He should be able and ready to throw his full force and mentality towards the front demanding most attention at the moment, to the end that each department is thus doubled in strength by having a strong reserve. To protect his departmental managers he must not handle any of their work alone, or without their cognizance; if he respects his assistants and wishes them respected by those subject to the authority he has delegated to them he must never deal directly with their assistants or their correspondents, for he thus, in deed, though perhaps not in word, has deposed them and curtailed their powers for future actions if he has not entirely destroyed their further usefulness to him.

Rates in New York to Be Reduced.

The Public Service Commission for the First District has taken under consideration and will act shortly upon a voluntary offer made last week by officials of the New York and Queens Electric Light & Power Company to reduce the maximum rate of that company for electric current from 12 cents to 9 cents per kilowatt-hour with certain provisos. This company furnishes current in all portions of Queens Borough save the Rockaways section. It is estimated that the proposed reductions would result in a saving annually to customers of $100,000. The new rate would go into effect on April 1, 1917, to be followed by another half-cent reduction on January 1, 1918. The company's minimum charge of $1.00 a month would be changed to a meter charge of 60 cents per month to be paid by all consumers.

THE PUBLIC UTILITY AND THE PEOPLE.

New Jersey Company Issues Statement Showing Increased Costs Which Operating Companies Have to Bear.

The Public Service Corporation of New Jersey, operating the Public Service Electric Company, the Public Service Gas Company and the Public Service Railway Company, has issued an interesting and comprehensive public statement over the signature of its president, Thomas N. McCarter. This announcement covering present-day costs of efficient public utility operation as allied with existing rates for such service and the current prices of other necessities of life, embraces a pertinent topic of universal interest,

A Public Service Statement

(No. 2)

During the year just ended Public Service carried more passengers on its street cars, supplied more cubic feet of gas and more kilowatts of electricity to a greater number of individuals, firms and corporations than ever before in its history. In other words, Public Service Railway Company, Public Service Gas Company and Public Service Electric Company, separately and collectively, rendered a greater volume of efficient service to a large majority of the people of the state than in any previous year.

This is a record of which the companies are justly proud, and the most remarkable fact about the achievement is that

—ALL OF THIS SERVICE—RAILWAY, GAS AND ELECTRIC—WAS FURNISHED WITHOUT ANY INCREASE IN PRICE TO THE CONSUMER.

Every householder, every business man, every individual who has had to purchase the necessities of life, or materials for trade or for manufacture, knows how prices of almost all other commodities have soared during the last twelvemonth, and yet Street Car Rides Cost No More, Gas Costs No More and Electricity Costs No More than either did before the era of high prices set in. Nor has the quality of service suffered; on the contrary, distinct improvement has been made.

Production costs, however, have materially advanced. This is probably true in every line of business and there is nothing magical about public utilities which enables them to escape the inexorable laws of trade. Every upward tendency in the price of materials and the price of labor must be met by the public utility just the same as it must be met by the merchant and the manufacturer.

But there is this great distinction which cannot be overlooked—the public utility is in a class by itself in that its rates for service are fixed and the increases in cost of production cannot be passed on to the consumer the same as is done in practically all other lines of business. The Increases Must Be Absorbed by The Operating Company; the company must stand the added cost of production without being able to correspondingly increase its charges for service. In this respect the company's loss is the consumer's gain and this advantage, measured in dollars and cents, during the last year alone, has meant to the people of New Jersey the saving of several millions of dollars.

It is no mere theory to say that several millions of dollars have been saved to patrons of Public Service by the fact that rates for Street Railway Transportation, Gas and Electricity have not been increased to keep pace with the added cost of production; it has been hard, practical fact.

These same persons are paying more today than they did a year ago for all the other necessities of life. They are paying more for bread and butter, for meats and groceries, for milk and eggs, for everything that goes on the table. They are paying more for woolen and cotton goods, for linens and laces, for hats and shoes, for everything in the line of wearing apparel. They are paying more for household effects, from kitchen utensils to parlor furniture, but they are paying NO MORE for Street Railway Transportation, Gas and Electricity than they did when the prices of all the other commodities, the price of labor and the sums levied for taxes were on a much lower level than they are at present.

The merchant, the manufacturer, the miner, the farmer, all have raised the prices of their products because of the increased cost of labor and materials. All have justified their action on the ground that it costs them more to produce, and, speaking generally, the claims are substantiated by facts. At the same time the increased costs have, in nearly all cases, been passed along to the consumer.

Street Railway Transportation, Gas and Electricity have been conspicuous exceptions to the general rule. Although the cost of their production has increased materially, the consumers have not been called upon to pay higher prices for them; the extra burdens have been borne by the operating companies.

And that there have been extra burdens is an easily demonstrable fact. Labor is an important item in the conduct of public utilities and labor has gone up. Coal is essential for the manufacture of Gas and Electricity, and through the use of the latter, for the moving of street cars, and coal has advanced in price. When contractors failed to make deliveries of coal Public Service has gone into the open market and paid as high as four dollars a ton above its contract price for coal in order to insure continuity of service.

The electric business cannot be conducted without the use of copper, and Public Service uses hundred of tons of the metal every year. In the past copper could be purchased as low as eleven or twelve cents a pound. A year or so ago the price was twenty cents and was then thought high. Now copper is hard to get at thirty-eight or even forty cents a pound and yet Public Service must pay the price.

To carry passengers it is necessary to provide and maintain tracks and equipment, and every item of material that enters into the construction and upkeep of tracks and cars has increased in price anywhere from five to four hundred per cent. Manganese steel, used in track intersections, curves and switches, has jumped from about $100 per ton to about $500 per ton. This is an extreme case, but a number of other metals and metal parts used in car building have been advanced in price more than 100 per cent and the general average increase in cost of all railway materials has been about forty per cent.

These facts are brought to public notice to show that Public Service has been compelled to meet extraordinary conditions during the last year, and that it has met them without shifting any of the burden to its patrons.

The 5 cent piece that will buy the same street car ride today it did a year ago will not buy the same size loaf of bread it used to buy.

The 90 cents spent for gas will buy 1,000 cubic feet today just as it did a year ago, but 90 cents will not go nearly so far as it used to when applied to the purchase of food or raiment.

Every dollar spent by the public for electricity buys just as much energy as formerly, but no dollar spent for other commodities can be made to equal the purchasing power of the dollar of the past.

These are facts worthy of serious consideration. They affect the welfare of the public. Might it not be well for the public to ponder what must happen if the price of labor, the cost of materials and the amount of taxes levied continue to mount year by year? There is a limit to everything, even to the ability to render service to the public at a fixed rate.

PUBLIC SERVICE CORPORATION OF NEW JERSEY.

By Thos. N. McCarter

January 2, 1917. President.

Half-Page Newspaper Advertisement on Electric Service Published in all New Jersey Papers.

making an appeal in direct and forceful manner to the intelligent, thoughtful citizen and consumer.

The announcement, termed "A Public Service Statement," reproduced in the accompanying illustration, has recently appeared in every important daily and weekly paper in the state, employing half-page or larger space to attract the attention of all possible readers. It points out in a frank and concise manner the prevailing condition of rising costs of operation in the field of public utilities and the established, stationary charges for service. In mentioning its record for the past year, during which period a greater distribution of electric energy and gas was evidenced than ever before, and more passengers carried on its traction lines, the company concludes with the statement:

"All of this service—railway, gas and electric—was furnished without any increase in price to the consumer."

Referring to the increased cost of operation of its different utilities, it is shown that while the overhead charges of generation, distribution, equipment, etc., have advanced continually, including labor, copper, rails and kindred items, there has been no increase in the rates for electric, gas or traction service; in this, the company says:

"The public utility is in a class by itself in that its rates for service are fixed and the increase in cost of production cannot be passed on to the consumer the same as is done in practically all other lines of business. The increases must be absorbed by the operating company; the company must stand the added cost of production without being able to correspondingly increase its charges for service. In this respect the company's loss is the consumer's gain and this advantage, measured in dollars and cents, during the last year alone, has meant to the people of New Jersey, the saving of several millions of dollars."

Specific reference is made at the conclusion of the announcement to the relation of the existing unit charges for traction, gas and electric service and the purchasing power of equal sums as applies to other commodities, as follows:

"The five-cent piece that will buy the same street-car ride to-day it did a year ago will not buy the same size loaf of bread it used to buy.

"The 90 cents spent for gas will buy 1,000 cubic feet today just as it did a year ago, but 90 cents will not go nearly so far as it used to when applied to the purchase of food or raiment.

"Every dollar spent by the public for electricity buys just as much energy as formerly, but no dollar spent for other commodities can be made to equal the purchasing power of the dollar of the past."

This statement is particularly opportune. It not only creates interest, but makes people think and more considerately appreciate the value received for funds expended for electric and other utility service. The announcement carries evidence of desire to maintain present rates as long as is physically possible, bringing to notice the considerations which would apply to any necessary rate increase in the future.

A statement of this nature by the public utility company, widely advanced to reach every possible consumer, will do far more to effect the correct attitude on the part of such consumers than would an ignoring of the problem until the vital time. It paves the way to a thorough understanding of the exact conditions the company must meet, with an assurance that in meeting these conditions in the months to come, the viewpoint and interest of the consumer will be kept in mind.

Carload of Washing Machines for Alliance (O.) Campaign.

With a record of selling 180 electric washing machines in 1916 and with excellent chances of surpassing this achievement during the coming year, the Alliance (O.) Gas & Power Company recently placed an order for a carload shipment of this appliance.

The order was placed with the Hurley Machine Company, of Chicago, and calls for 60 large-size machines which retail at $100 each. Excellent prospects are in view and H. F. Heyman, new-business manager, states that a three months' period will see the allotment disappear.

ELECTRICAL CONSTRUCTION

A Department Devoted to Problems Relating to the Installation, Operation and Maintenance of Electrical Equipment

THE SQUIRREL - CAGE - TYPE INDUCTION MOTOR AND ITS WIRING.

A Paper Presented at the Twelfth Annual Convention of the Western Association of Electrical Inspectors.

By G. S. Lawler.*

One of the most vexatious pieces of electrical apparatus to install from the wiring standpoint is the squirrel-cage induction motor. This motor is now used very generally and undoubtedly all those interested in the fire hazard of electrical apparatus are familiar with its appearance and know the functions of the various parts. Compared with other types of motors it is exceptionally safe from a fire standpoint. Improvements in the design of the rotor, principally in the method of securing the bars to the end rings, have practically eliminated this part of the machine as a possible cause of fire. The stator is the part where electrical troubles are usually experienced, but such troubles are relatively infrequent, unless the machine has been abused. The primary coils are stationary, so that they can be easily insulated and secured in place. Occasionally overheating at bearings results in fire, but this trouble is incident to any rapidly rotating machine.

The phase-wound rotor-type motor is almost as safe a piece of electrical apparatus as the cage-type motor. It has the hazards of any piece of rotating electrical machinery which has windings, the insulation of which may break down occasionally and cause trouble. Due to the insertion of resistance into the rotor circuit during starting, the motor accelerates with ample torque and a starting current which may be only slightly in excess of the full-load running current. The wires supplying such a motor can safely be selected on the basis that they are to carry a current only 25 per cent greater than the rated current capacity of the motor. An overload protective device, which will satisfactorily protect these wires, will not be opened by the starting current. As this type of motor offers no undue problem from an installation point of view, it will be dismissed from further consideration in this paper.

The selection of the size of the conductors to be used for supplying a single squirrel-cage motor has frequently been difficult to determine where it has been sought to have them as small as possible consistent with their proper protection by approved fuses. If the protection is to be afforded by a circuit-breaker equipped with time-element device, the problem largely disappears, for then the supply wire can be selected on the 25 per cent motor overload basis. By supply wires is meant the wires carrying the current of only a single motor. This circuit-breaker, of course, should not be set over 30 per cent above the capacity of the wires, or 62 per cent above the rated capacity of the motor. A circuit-breaker unequipped with time-element device is seldom used to protect a squirrel-cage motor, owing to the large amount of copper required in the supply wires in order that they may be protected according to the Code and the breaker will not be opened by the starting current.

A knowledge of the speed-torque and speed-current curves of the squirrel-cage motor is necessary for a full understanding of the problem. These curves may vary considerably and are dependent upon the design of the motor. To describe fully the effect of varying resistance in the rotor or varying voltage applied to the stator would necessitate a much longer paper than this one can be. It will suffice to say that these two factors exercise a great influence on the shape of the curves.

*Engineer, Associated Factory Mutual Insurance Companies, Boston, Mass.

Heavy Starting Current of Squirrel-Cage Motor.

The typical cage motor has a rotor of very low resistance, which is unchanged by the method of starting employed. The starting torque under full voltage is considerably higher than the minimum torque necessary to start the motor. If started under full voltage, a very heavy curent would be drawn from the line, gradually increasing as the torque developed by the motor increased to the maximum or "pull out" torque and then decreasing with the torque to the normal full-load current, assuming that the motor is to run under full-load conditions The maximum current taken under these conditions would vary between, say, 5 and 7 or 8 times full-load current, depending on the motor design.

The drawing of such a heavy current from the line is usually objectionable in several ways, especially where the motor is of large size and the system or lines to which it is connected is relatively small. To prevent the large initial current the voltage applied to the motor is generally reduced by means of a so-called autostarter or compensator, when the motor is five horsepower or larger in size, although under some conditions motors as large as 30 horsepower are started under full voltage.

The commercial autostarter has several taps brought out so that a choice of voltage to be impressed on the motor at starting may be had. The voltage of the taps varies between 40 to 80 or 85 per cent of line voltage. Generally for the best starting conditions the lowest starting voltage is chosen which will permit of the motor starting and accelerating. With such a voltage the starting current will be the lowest feasible and will be considerably less than that which would be drawn from the line under full line-voltage conditions. The starting current is proportional to the voltage applied to the motor. By using a suitable autostarter or compensator the starting current can be held down to from two to three times full-load running current.

Owing to the large starting current of cage-type induction motors, even when autostarters are used, the feasibility of their use depends considerably upon the relative current capacity of the system to which they are to be connected, the size of the supply lines and the nature of the remaining load on the lines. Many public service companies will not permit of cage-wound motors over a certain size being connected to their lines unless conditions are such that their use will not create disturbances. Mills and factories having relatively large generating plants or purchasing power in large blocks usually have a large number of motors in use and in their cases the characteristics of the cage-wound motor are not objectionable.

The wiring to the cage motor has been the cause of numerous complaints. Either it has been considered that the amount of copper necessary was excessive or else trouble has been experienced in selecting an overload protective device which will not be opened by the starting current, but which will suitably protect the motor lines.

Rule for Selecting Size of Motor Leads.

The original rule for selecting the size of leads reads as follows: "The motor leads or branch circuits must be designed to carry a current at least 25 per cent greater than that

for which the motor is rated. Where the wires under this rule would be overfused in order to provide for the starting current, as in the case of many of the alternating-current motors, the wires must be of such size as to be properly protected by these larger fuses."

This rule was definite, the emphasis being put on the last sixteen words. In many cases of close figuring, or uncertain conditions, however, it could not be determined whether the rule was likely to be complied with until after the motor had been wired and put in operation. The rule made the protective device the starting point for selecting the size of wire. The protective device, be it a set of fuses or a circuit-breaker, must not be opened by the starting current and the leads must be large enough to be protected by it. The rule required that those installing motors be familiar with the motor characteristics. These characteristics could be ascertained from the motor manufacturers, but frequently those installing the motors did not take the trouble to become familiar with the characteristics of the particular motors to be used, or else time was not available for obtaining the desired information. The result was that many installations were criticised or condemned as not complying with the Code rules.

The first cry for relief was from the excessive copper costs, the usual rule having been to provide copper under Rule 18 to carry about twice the rated current of the motor. The rule was changed to permit of the wires to a single motor being protected in accordance with Table B of Rule 18, where fuses were used, no matter whether the wire was rubber-covered or of the slow-burning type. This gave some relief, as the greater proportion of the wire used for the motor lines was rubber-covered.

The reason for permitting the use of Table B with rubber-covered wire was: first, that when the motors were running under normal conditions the wires were subjected to much less current than Table A would allow them to carry, and second, that the factor of safety under Table B appeared to be reasonable under the conditions. It is to be remembered that when carrying the current permitted by Table A approximately a 29 degree Fahrenheit rise in temperature is obtained, while when carrying the current called for by Table B a rise in temperature of approximately 68 degrees Fahrenheit is caused. It was felt that a 68-degree rise was all that should be permitted before the protective device operated even in the case of slow-burning wire. The insulation begins to deteriorate rapidly when an ultimate temperature of about 150 degrees Fahrenheit is reached.

The next complaint was that the rule did not definitely specify a particular size of wire for each size motor, but made the wire dependent on the starting fuse or circuit-breaker, which itself was not definitely fixed. The uncertainty had led to considerable trouble, due to lack of knowledge of the motor characteristics and the load conditions.

Determination of Overload Protective Device.

There are two chief factors involved in the determination of the size of overload protective device which it is necessary to use. The first is the shape of the speed-current curve. This is fixed as far as any one motor is concerned, but may vary considerably with motors of different designs, rated speeds, etc. The second is the rate at which the motor is accelerated when being started. This, while also dependent somewhat on motor design, is affected greatly by load conditions and differences in these conditions may cause a wide variation of acceleration rate even with identically similar motors. A slowly accelerated motor, of course, goes through identically the same current cycle as when accelerated rapidly, but the length of time consumed in the change is much greater and of course more heat is generated in the protecting fuses, causing them to open the circuit unless larger ones are used. The prolonged current might also cause the operation of a circuit-breaker having time-element device.

The rule was given further consideration and it was felt that it was a good one and should not be changed. The trouble was not in the rule, but in the understanding of the situation of many who had to deal with it. It was, however, thought that possibly a suggestion or guide to the proper size fuses necessary might clarify the situation and thus help to avoid trouble.

One of the larger electrical companies made a number of tests of squirrel-cage type polyphase induction motors of various sizes starting under sufficient load to cause a slower rate of acceleration than was generally true. The tests were made with the higher voltage taps of the starting compensators. These tests tended toward extreme conditions rather than easy or medium ones. Various sizes of fuses were used in order to determine which sizes would just comfortably carry the starting currents without opening.

These tests gave data for choosing ratios between the sizes of starting fuses necessary and the full-load ampere ratings of the motors. These ratios are included as percentages in the fine-print notes of rules 8*c* and 23*e* of the Code. The percentages are offered as a guide and are not to be taken as the rule itself. While there may be a few extreme cases where fuses selected in accordance with the percentages may not carry the starting currents without blowing, these cases will be relatively rare, and the fact that the starting conditions are extreme should be evident to those installing the motors.

The percentages have a pronounced factor of safety where starting conditions are easy and those thoroughly familiar with the characteristics of the motors and the starting conditions can oftentimes select smaller fuses than suggested by the percentages without running into difficulty.

It might be mentioned, in passing, that the reason for decreasing percentages with increased size of motor is due to the greater time lag in the larger fuses. The relative time lags of different capacities of enclosed type fuses is indicated in the table of Rule 68*h*, which specifies the time in which these fuses must blow when subjected to 50 per cent overload in amperes.

Particular attention is called to the fact that the ampere rating on the motor name plate is taken as the basis for using the percentage. This is necessary owing to the variation of the full-load current of motors, even of the same size and voltage when the speed is different. For example, considering the 440-volt, three-phase, 60-cycle standard motors, made by one of the most prominent manufacturers, we find that a 10-horsepower, 1,800-revolution-per-minute motor has a full-load current of 12.3 amperes, while the same size motor running at 600 revolutions per minute has a full-load current of 17 amperes. The difference is 38 per cent. Again taking a 50-horsepower motor running at 1,800 revolutions per minute, the full-load current is 58 amperes, while the same size motor running at 450 revolutions per minute has a full-load current rating of 75 amperes. The difference is 29 per cent. This difference in current rating for different speeds of the same size motors holds true for the other size motors, although the amount of the difference may vary.

Oftentimes the sizes of starting fuses have been determined by calculation and while the results may be satisfactory in a good many cases they have led to difficulty in others. The reason for the difficulty is indicated by the examples given in the preceding paragraph. The only safe way is to take the current rating on the motor name plate as a basis.

In some cases the percentage of 150 for motors having a full-load current of over 100 amperes has caused some confusion. Where the motor wires are selected under Table B of Rule 18 by using this percentage a smaller wire or cable is indicated than called for under Table A using a 25 per cent motor overload as a basis of figuring. It is to be remembered that the requirement of the fifth paragraph of Rule 8*b* is a Code rule, while the fine-print note following the fifth paragraph of 8*c* is merely a suggestion; therefore, if the size wire suggested by the fine-print note is smaller than called for by rule 8*b*, the suggested size should be disregarded and that

called for by the rule used. The rule, of course, is based on Table A of Rule 18 when the wire is of the rubber-covered type and on Table B when the wire is of the slow-burning type.

Wiring for a Group of Motors.

A matter which will be just touched upon here, although of considerable importance, is the question of the size of wires and cables carrying the current of more than one motor. It has been the general rule to have these wires large enough to carry the total connected motor load plus a small amount more, such as, for instance, 25 per cent of the rated load of the largest motor connected to them. The load-factor† is involved as far as the current in the conductors is concerned and in many cases the maximum load-factor occurring may be so low that much more copper has been provided under this rule than necessary to safely carry the current. Undoubtedly an intelligent investigation of conditions before installing the conductors would permit of a minimum amount of copper being safely used and still have the conductors properly protected by the fuses or circuit-breakers. The difficulty is to determine the load-factor in advance. This would depend on the number of motors connected to the line and the character of the motor load. The load-factor would vary widely in different installations and while a certain load-factor might be safely taken as a basis of calculation in one plant, it would be very unsafe to use it in another. A considerable discussion along these lines would be very interesting and instructive.

In addition to the ordinary fire hazard of wires carrying current, the principal hazard incident to the wiring of squirrel-cage induction motors lies in the relation between the sizes of the fuses or circuit-breakers and the sizes of the wires and motors. It can be seen from the table of percentages in Rule 8*c* that unless so-called running fuses are used the motors are poorly protected from undue overloads, and this is especially true for the smaller motors which are started under full voltage. An overload in many instances will be permitted by the fuses, which will cause the roasting of the motor insulation. Running fuses of proper capacity or suitable circuit-breakers equipped with time-element devices will safeguard the motors reasonably well.

The hazard to the wires lies principally in the fact that, due to poor judgment, fuses of too small capacity have been originally selected, resulting in their being replaced by fuses of too large capacity to suitably protect the wires. In many cases where the original fuses were the largest suitable for the cutouts the temptation to avoid changing the cutouts has led to overloading the fuses by refilling or bridging the terminals. This overloading of the fuses not only endangers the wires, but also renders the fuses a distinct fire hazard, especially under short-circuit conditions.

†The term "demand-factor" should be used instead of "load-factor," throughout this paragraph, in accordance with the standard definitions of the American Institute of Electrical Engineers.

Wiring Rules Adopted at Concord, Mass.

The Municipal Light Board of Concord, Mass., has adopted a set of special rules, which has the indorsement of the municipal inspector, who will enforce the regulations. They require that a space 18 inches square shall be reserved on the meter board for each meter, and a separate cutout shall be installed between the service switch and each meter if more than one is installed.

All wires for cooking, heating and power circuits shall be either in rigid or flexible conduit or covered with flexible-metal covering similar to BX. Under no consideration shall lighting, cooking and heating and power wires be installed in the same conduit. All heating receptacles shall be polarity receptacles, of a minimum capacity of 20 amperes at 250 volts. Each receptacle shall be marked, or indicated with tags supplied by the department.

INSTALLATION AND OPERATION OF INDUCTION MOTORS.

Report of Committee on This Subject Presented to Western Association of Electrical Inspectors.

The Committee on Installation and Operation of Induction Motors, K. W. Adkins, chairman, presented an important report to the twelfth annual convention of the Western Association of Electrical Inspectors, held at Toledo, O., on January 23 to 25. This report with its valuable tables is published below in slightly condensed form.

The principal rules of the National Electrical Code for 1915 as applying to this class of wiring are as follows: Rule 8*b*, fifth and sixth paragraphs; Rule 8*c*, fifth paragraph.

A portion of this latter rule applies only to the size of rubber-covered conductors used with alternating-current motors taking large starting currents. The size of fuses or other protective devices, of course, depends entirely on the starting characteristics of the motor. These rules take the protective device as the starting point in selecting the size of the wire and permit the wire to be selected on the basis that its carrying capacity is in accordance with Table B, of Rule 18.

Switches should have a rated capacity at least as large as the rated capacity of the fuses protecting the circuit, or, if the circuit is protected by a circut-breaker, the switch should have such capacity that the breaker will not be set to be opened by a current greater than 30 per cent larger than the current rating of the switch. The same rules should apply when approved compensators are used in lieu of switches.

We believe that it was intended that the rules should be interpreted to differentiate between motors taking large starting currents, such as the squirrel-cage type of motor, and types which do not take these large starting currents, such as the wound-rotor, slip-ring type of motor, as the rule quoted particularly mentions "motor of a type requiring large starting current." This means the squirrel-cage type of motor or motors having similar starting characteristics and is intended to exclude the wound-rotor, slip-ring type of motor, which need have its leads designed to carry a current of only 25 per cent greater than that for which the motor is rated.

Rule 8*c*, fifth paragraph, should not be considered as to cancel the fifth paragraph of Rule 8*b*, which plainly states that conductors must be designed to carry a current at least 25 per cent greater than that for which the motor is rated. The size of wires should be checked to see that conductors calculated in accordance with the advisory percentage table given under Rule 8*c* will also meet the requirements of Rule 8*b* as to conductor capacity.

Following are tables calculated in accordance with the above Code rules, and should apply primarily for wiring to the squirrel-cage type of motor or motors having similar starting characteristics. Where motors are not started by means of approved autostarters, wires one size larger than size given in tables will, in the majority of cases, meet requirements of the rules.

The current values used in these tables are the average current values of motors of different types, frequencies and speeds and a variation of 10 per cent higher or lower may be expected. The question of drop is not taken into consideration in these tables.

The fusing of conductors in accordance with Table B, of Rule 18, is for the protection of the wires to the motor and is considered as giving adequate protection from injury when fused in accordance with these rules, but the motor itself will not be protected against continuous overloads, which would not cause these fuses to blow, but still would be larger than the motor could safely stand for any length of time; therefore, it is customary to pro-

vide "running fuses" which are not in circuit during the starting period of motor.

The rules require that motor and starting device be protected and for ordinary service the protection of motor by fuses or circuit-breaker rated 25 to 30 per cent greater than that for which the motor is rated will insure proper protection for motor and starting device. For alternating-current motors of the varying (or variable) speed type, used in intermittent service, it is not so essential that "running fuses" be provided, as these motors are designed for an overload capacity of from 200 to 250 per cent for short periods of time and adequate protection is generally afforded these motors by fuses of per cent rating as given in table for wire size to be used with these types of motors for the several classifications of service. Wire sizes for varying (or variable) speed motors, according to the Code, must be selected from Table A or B of Rule 18, depending upon the type of insulation of the conductors, and the Code does not permit, for this service, conductors having rubber insulation being protected by fuses rated in accordance with Table B of Rule 18.

The tables submitted give wire size for supplying a single motor. In order to calculate the size of mains to supply more than one motor, the probable maximum current to

INDUCTION MOTORS—SINGLE PHASE, 110, 220, 440, 550 VOLTS—All Frequencies and Standard Speeds.

	Full Load Amps.				Starting Fuse Amps.				Running Fuse Amps.				Size of Wires: Rubber Insulation				Size of Wires: Other Insulation			
H. P.	110V.	220V	440V.	550V.	110V.	220V.	440V.	550V.	110V.	220V.	440V.	550V.	110V.	220V.	440V.	550V.	110V.	220V.	440V.	550V.
.5	6.8	3.4	1.7	1.3	20	10	5	5	10	5	5	5	14	14	14	14	14	14	14	14
1	13.3	6.6	3.3	2.4	35	20	10	5	20	10	5	5	8	12	14	14	8	12	14	14
2	24.8	12.4	6.2	4.9	65	35	20	15	30	15	10	5	6	8	12	14	6	8	12	14
3	36	18	9	7.2	75	45	30	25	45	25	15	10	4	8	10	12	4	8	10	12
5	58.4	29.2	14.6	13.8	120	70	40	30	75	40	20	15	2	6	8	10	2	6	8	10
7.5	85.2	42.6	21.3	17.1	170	85	55	45	100	55	30	25	0	4	6	8	0	4	6	8
10	110	55	27.5	22.4	175	110	70	60	140	65	35	30	00	2	6	6	0	2	6	6
15	162	81	40.5	33	245	165	80	70	200	100	50	40	200.000	0	4	6	000	0	4	6
20	208	104	52	42.6	315	160	110	85	260	130	65	55	300.000	00	2	4	0000	0	2	4
25	258	129	64.5	51.2	385	195	135	100	320	160	80	65	400.000	000	1	2	300.000	0	1	2
30	304	152	76	61	450	225	150	125	380	190	95	85	500.000	200.000	1	2	350.000	00	1	2
35	356	178	89	70	535	270	180	140	445	220	110	90	600.000	211.600	0	1	450.000	000	0	1
40	400	200	100	80	600	300	200	160	500	250	125	100	700.000	300.000	0	0	500.000	200.000	0	0
50	492	246	123	99	740	370	185	200	615	300	150	125	950.000	400.000	00	0	700.000	300.000	0	0

INDUCTION MOTORS—TWO PHASE, 110, 220, 440, 550 VOLTS—Four Wire—All Frequencies and Standard Speeds

	Full Load Amps.*				Starting Fuse Amps.				Running Fuse Amps.				Size of Wires: Rubber Insulation				Size of Wires: Other Insulation			
H. P.	110V.	220V.	440V.	550V.	110V.	220V.	440V.	550V.	110V.	220V.	440V.	550V.	110V.	220V.	440V	550V.	110V	220V.	440V.	550V.
.5	3.1	1.5	.8	.6	10	5	5	5	5	5	5	5	14	14	14	14	14	14	14	14
1	6	3	1.5	1.1	15	10	5	5	10	5	5	5	14	14	14	14	14	14	14	14
2	11	5.6	2.8	2.2	30	15	10	5	15	10	5	5	10	14	14	14	10	14	14	14
3	14.7	7.3	3.6	3.2	40	25	15	10	20	10	5	5	8	12	14	14	8	12	14	14
5	28.6	14.3	7.1	5.3	70	35	20	15	35	20	10	10	6	8	12	14	6	8	12	14
7.5	38.8	19.4	9.7	7.8	80	50	30	20	50	25	15	10	4	8	10	12	4	8	10	12
10	50.2	25.1	12.5	10.8	100	65	35	30	65	30	15	15	2	6	8	10	2	6	8	10
15	73.4	36.7	18.3	15	150	75	45	40	90	45	25	20	1	4	8	8	1	4	8	8
20	95	47.5	23.7	19.5	190	95	60	50	125	60	40	25	0	2	6	8	0	2	6	8
25	118	59	29.5	23.4	180	120	70	60	150	75	35	30	00	2	6	6	0	2	6	6
30	138	69	34.5	27.6	210	140	75	65	165	85	45	35	000	1	4	6	00	1	4	6
35	162	81.3	40.5	32	240	160	80	70	200	100	50	40	200.000	0	3	6	000	0	4	6
40	182	91	45.5	36.4	275	175	90	75	225	115	55	45	211.600	0	4	6	000	0	4	6
50	224	112	56	45	335	180	110	90	280	140	70	55	300.000	00	2	4	250.000	0	2	4
60	268	134	67	53.5	400	200	135	110	335	165	85	65	450.000	000	1	2	300.000	0	1	2
75	332	166	83	66.5	500	250	165	130	420	210	100	80	950.000	0000	0	1	400.000	000	0	1
100	.....	218	109	87.5	.....	330	170	175	.....	270	135	110	.....	300.000	00	0	.....	250.000	0	0
150	.....	320	160	128	.....	480	240	190	.....	400	200	160	.....	500.000	200.000	000	.....	400.000	000	0
200	.....	418	209	169	.....	630	320	250	.....	520	260	210	.....	750.000	300.000	0000	.....	550.000	0000	0000
250	.....	515	257	207	.....	760	385	310	.....	640	320	260	.....	1,000.000	400.000	300.000	.....	700.000	300.000	0000
300	.....	615	307	246	.....	920	460	370	.....	765	385	310	.....	1,300.000	500.000	350.000	.....	900.000	400.000	300.000

*Values of current in common wire for a two-phase three-wire system would be 1.42 times value given.

INDUCTION MOTORS—THREE PHASE, 110, 220, 440, 550 VOLTS—All Frequencies and Standard Speeds

	Full Load Amps.				Starting Fuse Amps.				Running Fuse Amps.				Size of Wires: Rubber Insulation				Size of Wires: Other Insulation			
H. P.	110V.	220V.	440V	550V	110V.	220V.	440V.	550V.	110V.	220V.	440V.	550V.	110V.	220V.	440V.	550V.	110V.	220V.	440V.	550V.
5	3.6	1.8	9	.7	10	5	5	5	10	5	5	5	14	14	14	14	14	14	14	14
1	7	3.5	1.75	1.3	20	10	5	5	10	5	5	5	14	14	14	14	14	14	14	14
2	13	6.5	3.25	2.6	30	20	15	10	15	10	5	5	10	12	14	14	10	12	14	14
3	19	9.5	4.75	3.8	50	30	20	10	20	15	5	5	8	10	14	14	8	10	14	14
5	30.8	15.4	7.7	6.2	70	40	25	15	35	20	10	10	6	8	12	14	6	8	12	14
7.5	44.8	22.4	11.2	9	90	60	30	25	55	35	15	10	4	6	10	12	4	6	10	12
10	58	29	14.5	11.8	120	70	40	30	70	35	20	15	2	6	8	10	2	6	8	10
15	85	42.5	21.2	17.4	165	85	50	40	100	50	25	20	0	4	8	8	0	4	8	8
20	110	55	27.5	22.5	170	110	65	55	140	80	35	30	00	2	6	6	0	2	6	6
25	136	68	34	27	210	140	70	65	170	85	40	35	000	1	6	6	00	1	6	6
30	160	80	40	32	240	160	80	70	200	100	50	40	200.000	0	4	6	000	0	4	6
35	188	94	47	37	280	185	95	75	235	125	60	45	250.000	0	2	4	200.000	0	2	4
40	210	105	52.5	42	320	190	110	85	260	130	65	55	300.000	00	2	4	211.600	0	2	4
50	260	130	65	52	390	195	130	110	300	165	80	65	350.000	000	1	2	300.000	0	1	2
60	310	155	77.5	62	470	230	160	125	385	190	95	85	500.000	200.000	0	2	400.000	000	0	2
75	384	192	86	77	575	290	175	160	480	240	100	95	700.000	300.000	0	0	500.000	300.000	0	0
100	.....	252	126	101	.....	380	190	175	.....	310	150	125	.....	400.000	00	0	.....	300.000	0	0
150	.....	368	184	148	.....	550	275	220	.....	460	230	185	.....	650.000	250.000	200.000	.....	450.000	000	00
200	.....	484	242	195	.....	720	360	290	.....	600	300	240	.....	900.000	400.000	250.000	.....	650.000	300.000	200.000
250	.....	595	287	240	.....	890	420	360	.....	740	360	300	.....	1,250.000	450.000	350.000	.....	900.000	350.000	300.000
300	.....	710	355	285	.....	1065	530	430	.....	890	445	350	.....	1,600.000	650.000	450.000	.....	1,100.000	450.000	350.000

Tables of Fuse and Wire Sizes for Induction Motors of Squirrel-Cage Type or Similar Types Taking Large Starting Currents.

be carried by such mains must be determined and, in the absence of any definite demand-factor, the only safe way is not to consider a demand-factor in determining the size of mains, but to take the sum of the full-load current of all the motors supplied, plus the current required to start the largest motor supplied from such mains, and from this total select a wire size from Table A or B of Rule 18, according to insulation. The Code does not permit conductors for mains having rubber insulation being protected by fuses rated in accordance with Table B, of Rule 18.

For the usual factory conditions, the maximum current to be carried by mains would generally be less than the sum of the full-load currents of the motors connected to the mains. As in most cases it would seldom occur that all the motors would be carrying full-load current at the same time, consequently a demand-factor might be considered. This, however, may be from 40 to 80 per cent, depending upon the nature of the work, number and size of motors supplied from such mains, and to determine the proper demand-factor would be an engineering rather than an inspection problem. Under these conditions we would not recommend the use of an estimated demand-factor in calculating the size of mains, unless it can be shown that a certain per cent demand-factor is suitable in each specific case. Should a demand-factor be considered, the size of wire for mains should be checked, to prevent error, by assuming the largest motor starting and all the other motors running, allowing the per cent demand-factor of the full-load current of these motors. Allowance should be made for the probable growth of the business.

We believe it advisable in order to maintain uniformity on installation of induction motors, to include a few specific requirements, as follows:

That each motor of one-fourth horsepower or over be provided with individual fuse protection.

That all motors aboye five horsepower should be provided with approved starting devices.

Motors without compensators must be started by approved switch, which switch must be provided with spring release on starting side, so it will remain in the starting position only when held there.

That proper rated running fuses be required for all motors of one horsepower and above.

That series relays be accepted in lieu of running fuses for motor protection in plants where care and adjustment of relays is under competent supervision.

That approved compensators be accepted in lieu of switches as required by the rules, provided switches of compensators disconnect all wires to motor.

When compensators of the type using two single-coil transformers on two and three-phase systems are used, the middle fuse on three-phase system on the "running side" may be omitted, and when this type of starter is used on a two-phase, four-wire system, one fuse in each phase on the "running side" may be omitted.

Where induction motors are started by star-delta switches, the same rules to apply as for motors started by approved compensators.

Alternating-current motors of the repulsion and slip-ring types should not be installed where subject to inflammable gases, or flyings of combustible materials, unless gas and dust-tight casings properly inclose commutator or slip rings of motor; or the motor should be properly inclosed in a cabinet or room, subject to approval of inspection department having jurisdiction.

Hint for Drilling Marble and Slate.

When drilling marble and slate for switchboards and the like, the work is made considerably easier if a slot is ground or filed in the point of the drill, as shown. The depth of the slot should vary with the diameter of the drill, ranging from one-eighth to one-fourth inch. The angle between the cutting edges and the sides of the slot should be about 80 degrees, as indicated in the end view. Frequently it is necessary to soften and reharden the drill after slotting, especially when the slot is cut with a file or saw. This slotting must be very carefully done, in order to prevent splitting and to get the slot in the center of the end. This method has been used with considerable success on a number of occasions. The slot gives the pulverized material a better chance to work its way to the large grooves of the drill, thus keeping its point unobstructed.

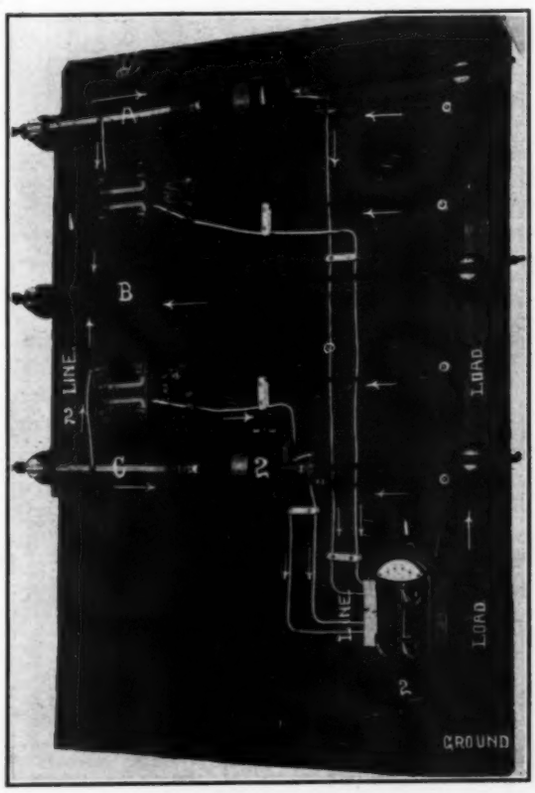
Slotted Drill for Drilling Marble or Slate.

Demonstrating Proper Connection of Polyphase Watt-Hour Meters.

The accompanying illustration shows a sample three-phase 2,200-volt meter installation which was assembled on a special board by the meter department of the Texas Power & Light Company in order to properly instruct new metermen regarding the proper connection of this type of installation.

Many 2,200-volt induction-motor installations are in use on this company's lines and due to the fact that with a highly inductive load both meter elements may rotate in the proper direction, even though the meter is improperly connected, it is necessary to instruct employees thoroughly in the fundamentals of this type of meter installation.

By means of an induction motor, which may be loaded as desired, the new meterman can be given an actual physical demonstration of how power-factor will change the direction of rotation.



Panel for Demonstrating Meter Connection.

DEALER AND STOREKEEPER

An Exchange of Ideas and Experiences on Advertising and Selling Methods, and Storekeeping for the Dealer in Electrical Appliances

Electric-Fixture Dealer Gives Views on Conducting Successful Business.

By Ira R. Alexander.

"A dealer in electric-lighting fixtures should remember that first impressions form lasting ones," recently said Clark Rider, of the Denver (Colo.) Electrical Company, "and he should arrange his stock of fixtures in his display rooms accordingly.

"The best quality of fixtures should have their place in the display windows and the interior where they will be seen by persons as they enter the store. This tends to give a first impression that the concern is one that handles quality goods—a good impression that they will carry away with them.

"At our store," continued Mr. Rider, "we feature the best we have in fixtures by placing them where they can be seen from the sidewalk and where one can inspect them on first entering the store. This enables us to show that stock of fixtures first, and if a sale is made so much the better for us and the person buying the fixtures. However, if the person does not find what he or she wants from a price standpoint we still have the cheaper fixtures to show them in our back display rooms. Thus, in that way, we can often save a sale, while at the same time it becomes known that we stand for quality in electrical fixtures. We find that it is a policy that pays, and pays well."

During the recent holiday season the company featured a special sale on a $15.00 dining-room fixture, the sale price being $5.00. One of these fixtures was placed in a display window with a card announcing the original and sales prices.

In speaking of the holiday sale, Mr. Rider said, "We had such a big holiday business as a result of featuring the special sale that we could hardly take care of it. The sale brought us a great amount of new customers, paving the way to future business. The sale also served the purpose of bringing people to our store to get acquainted with us, and we were given opportunities to show them our new display rooms. When they are in the market again for something in our line I feel sure that the most of them will remember us." Special sales like this are good advertising mediums, provided they are not held too often—in which case the standard of a concern is lowered and the element of cheapness enters in. However, sales customers who are satisfied usually become future customers and it is in this way that special sales prove of lasting benefit to the merchandiser.

Mr. Rider believes in an attractive exterior as a means to give his store advertising. Just recently he placed a large electric United States flag over the entrance, which serves to drawn a good deal of attention to the store, especially at night.

Design of Store Front Has Much to Do with Good Displays.

The accompanying illustration shows one of the first window displays made by the firm of S. D. Moran & Son, of South Bend, Ind., in its new store in that city. It shows how in re-arranging the store front a deep entrance bay was built to provide a goodly amount of window frontage. Panelled walls and ceilings, as well as the backgrounds cutting off the view into the store, were installed to make the detail involved in changing displays as simple as possible. Above the display-window space proper are half-story display spaces in which the concern is able to show lighting fixtures in an excellent manner.

The most noteworthy feature of this store front is that it was designed with a view to economy and facility in making displays. With a few "props," an attractive exhibit

Showing Good Arrangement of Store Front.

can be arranged because the character of the front, good backgrounds and illumination cannot help but set it off. So that it is noticeably pleasing to the passersby.

Keeping Advertising Copy Seasonable.

The other morning passengers on one of the Chicago elevated railroads shivered as they crowded into an express train bound for downtown. It was a cold morning, and everybody was thinking, doubtlessly, of overcoats, gloves and other appurtenances of fall.

One passenger let his gaze rest upon the car card opposite him, and read the following highly interesting suggestion from a well known electrical concern:

"Get your electric fans now and be prepared. Prices, $5.50 up."

Of course, that particular car card is not going to get any business for the dealer—now—much as it may have helped him some months ago. On the other hand, it suggests, in a rather conspicuous way, that the concern is not onto its job, insofar as taking care of its publicity is concerned. Advertising electric fans when the mercury is threatening the freezing point is almost as bad as keeping a fly-screen advertisement running in December, as has sometimes happened.

It costs money to advertise, and advertising that is not effective is a double loss. The dealer who is running street-car cards should realize that in order to return any part of the advertising investment they must tell a story which is in keeping with conditions, and that requires changing copy with the seasons. The same position occupied by a card telling about the advantages of electric toasters would doubtless have produced some inquiries.

Prizes Awarded in Big Display Contest

Window-Display Contest Proves That Rivalry Between Dealers Profitable and of Educational Value to Contestants and Contest Management

SELLING value of window displays, by which is meant their influence upon prospective customers to purchase, formed the chief basis on which entries were judged in the second window-display contest conducted by the National Lamp Works, of the General Electric Company. While selling value was the main consideration in making the awards, the merit of the displays was also judged on their attention value, on the presentation of new and unusual arrangements or devices used to demonstrate electric lamps, for inducing sales or attracting attention, and on neat and harmonious arrangements of displays.

The contest, which opened the first of last October and closed December 15, proved, by the large number of entries and the hundreds of photographs of displays submitted, an efficient means for sales stimulation and awakening dealers to the value of the display window as a spokesman for the store. Sixty main prizes, ranging in value from a touring car to a $5 gold piece, were offered as an inducement for dealers to enter the contest. Besides these there were seven territorial prizes, three prizes to dealers carrying different classes of lamp contracts, prizes for the best displays made during each month of the contest, and prizes for the best set of two and for the best set of three or more displays made by single entrants. So numerous were the displays of exceptional value entered that a list of 21 entries, deserving of honorable mention and a special award, was added to the winners of the origin awards.

In making the awards, the board of judges, composed of N. H. Boynton, advertising manager of the National Lamp Works; A. A. Gray, general manager of the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN, and F. M. Feiker, editor of *Electrical World*, were influenced by the amount of personal appeal made by the displays, a fact worthy of special note being that the winners of the first six prizes arranged exhibits in which people took an active part in drawing crowds and in putting over selling arguments. The judges experienced some difficulty in selecting the winner of the grand prize, but by gradual elimination the choice lay between six entries, and of these the display exhibited by W. B. McSpadden, of the Bristol (Va.-Tenn.) Gas & Electric Company, was finally chosen as the best because of its effectiveness in producing sales together with the simplicity of design.

Design of Prize-Winning Display.

The scheme of the display carried two convincing features. Of first importance was the type of illumination. This was produced through the use of seven 150-watt Mazda lamps in reflectors set close around the outer rim of the window, and one 300-watt Mazda lamp in a 19-inch fixture in the center. This brilliant illumination was the means of attracting passersby to the window, but the next problem confronted was how best to hold their attention.

A desk and typewriter had been placed in the window directly under the large fixture, and here one of the members of the new-business department typed suggestions, taking "better light" as his subject and using telegraph blanks, procured from the Western Union Company, for the occasion. As each suggestion was finished it was suspended from a file on the side of the desk in plain view, and attracted instant attention. Mingled with the audience were many persons who were recognized as prospects for better lighting, and this opportunity was taken to offer suggestions to them and the desire on the Bristol company's part to improve their lighting conditions. In this manner the personal touch was given in each suggestion and created favorable comment.

Aside from the fact that the display won the contest it was also the means of winning lighting customers for the Bristol company, according to R. E. Landers, new-business manager. Four large installations of new lamps and fixtures together with numerous smaller orders were secured. The display also effected the sale of six case-lot orders as well as counter sales showing a good increase.

The winner of the second award, L. J. Sewell, of the Lehigh Valley Light & Power Company, Allentown, Pa., won the grand prize in the 1915 contest.

How the Prizes Were Distributed.

Winners of Main Prizes—

1.—W. B. McSpadden, Bristol Gas & Electric Co., Bristol, Va.-Tenn.
2.—L. J Sewell, Lehigh Valley Light & Power Co., Allentown, Pa.
3.—L. E. Ragan, The Rome Gas, Electric Light & Power Co., Rome, N. Y.
4.—F. P. Safford, Denver Gas & Electric Light Co., Denver, Colo.
5.—O. F. Rost, Newark Electric Supply Co., Newark, N. J.
6.—Wheeler Co., Kansas City, Mo.
7.—Schuenemann Electric Co., Cleveland, O.
8.—H. Buland, Public Service Co. of No. Ill., Pontiac, Ill.
9.—F. E. Johnson, A. L. Hall Sporting Goods Co., Seattle, Wash.
10.—Gregory M. Bell, W. E. Snelling's Pharmacies, Norfolk, Va.
11.—Van Antwerp's Drug Corp., Inc., Mobile, Ala.
12.—Speiger and Huribut, Inc., Seattle, Wash.
13.—C. N. Hookey, Natrona Hardware Co., Natrona, Pa.
14.—H. P. Kerr, Wolfe Electric Company, Omaha, Neb.
15.—Huey & Philps Hardware Co., Dallas, Tex.
16.—J. R. Durban, J. R. Durban Electric & Mfg. Co., Webster Grove, Mo.
17.—S. D. Moran, S. D. Moran & Son, South Bend, Ind.
18.—The Lorain Electric Service Company, Lorain, O.
19.—Louis Koehl, Cleveland, O.
20.—W. F. Lawson, The Doerr-Mitchell Electric Co., Spokane, Wash.
21.—G. B. Pickel, Empire District Electric Co., Joplin, Mo.
22.—G. H. Tifft, Thompson Chandelier Mfg. Co., Akron, O.
23.—William Hall, Laube Electric Construction Co., Rochester, N. Y.
24.—W. L. Bowdoin, Montgomery Light & Water Power Co., Montgomery, Ala.
25.—N. L. Walker, Raleigh, N. C.
26.—Beaver Electric Company, Portland, Ore.
27.—Miss M. E. Tolan, H. C. Roberts Electric Supply Co., Philadelphia, Pa.
28.—John Schaub, Schaub Bros., Madison, Wis.
29.—Thos. McGoey, Grand Forks, N. D.
30.—Robert A. Wood, Brush Electric Co., Galveston, Tex.
31.—O. A. Acuff, Massilon Electric & Gas Co., Massilon, O.
32.—Conduit-Miller Co., Inc., Syracuse, N. Y.
33.—J. S. Martin, Modern Electric Co., Bellingham, Wash.
34.—Geo. Worthington Co., Cleveland, O.
35.—F. J. O'Neil, Cleveland, O.
36.—L. C. Goodwin, Durham Traction Co., Durham, N. C.
37.—L. B. Round, Pennsylvania Power Co., Ellwood City, Pa.
38.—C. P. Lynden, Federal Sign System, Detroit, Mich.
39.—Roy H. Poore, Peoples Hardware Co., Gary, Ind.
40.—Anton Henn, The Electric Shop, Le Mars, Iowa.
41.—The Post-Glover Electric Co., Cincinnati, O.
42.—David Bradley, Beal's Pure Food Grocery, Minier, Ill.
43.—Guy Carlton, Bloomington, Ill.
44.—H. J. Wigge, William Hall Electric Co., Dayton, O.
45.—C. H. Saunders, Tri-City Electric Co., Moline, Ill.

Winners of Territorial Prizes—

1.—W. A. Turner, Narragansett Electric Lighting Co., Arctic, R. I.
2.—W. B. Stewart, F. H. Stewart Electric Co., Philadelphia, Pa.
3.—S. C. Irby, Hattiesburg Traction Co., Hattiesburg, Miss.
4.—H. L. Peters, Salina Light, Power & Gas Co., Salina, Kans.
5.—C. J. Eucher, Cleveland, O.
6.—F. R. Fleck, Tri-City Railway & Light Co., Davenport, Iowa.
7.—F. E. Wright, Superior Cyclery, Lodi, Cal.

Winners of Class of Contract Prizes—

1.—Blessing Bros., Fennimore, Wis.
2.—Harry I. Wood Co., Louisville, Ky.
3.—Meridian Light and Railway Co., Meridian, Miss.

Winners of Group Prizes—

A.—Walter J. Smith, Odell Hardware Co., Greensboro, N. C. (2 photos.)
B.—J. I. Bronson, Jacksonville, Fla. (3 or more photos.)

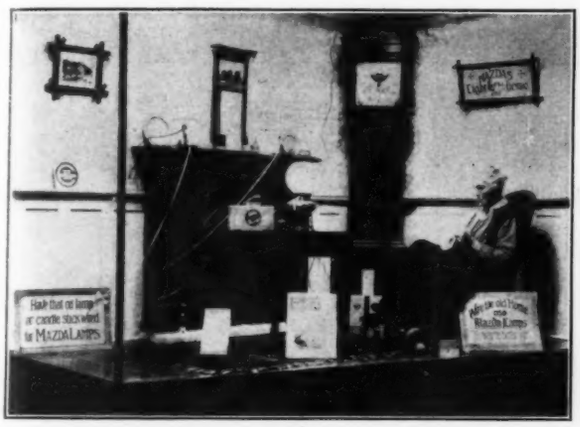
Winners of Monthly Prizes—

October—C. E. Yacoll, The Youngstown (O.) & Sharon Street Ry. Co.
November—Mr. MacKim, Potter Hardware Co., Cleveland, O.
December—August Tuor, Fargo Plbg. & Heating Co., Fargo, N. D.

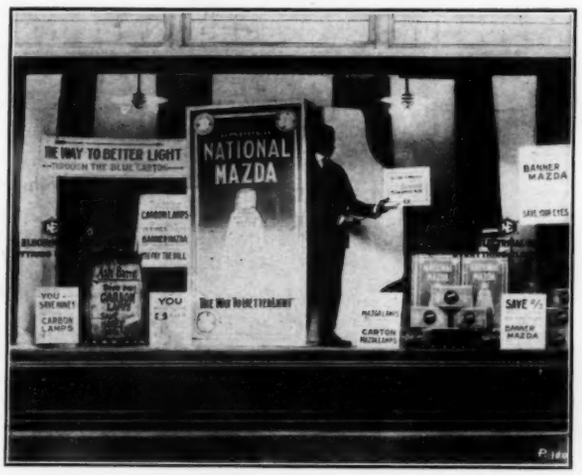
Winners in National Lamp Window-Display Contest

Window of Bristol Gas & Electric Company Which Won First Prize. Messages Pertaining to Mazda Lamps Were Written by the Operator and Placed on a File in View of Passers-by.

Window of Lehigh Valley Light & Power Company Which Won Second Prize. The Teacher Explained and Demonstrated the Merits of Mazda Lamps to the Class in the Background.



Window of Rome Gas, Electric Light & Power Company Which Won Third Prize—The Message Conveyed Was That Mazda Lamps Would Modernize Even the Oldest Home. A Live Model Is Used.



Window of Newark Electric Supply Company Which Won Fourth Prize.—The Demonstrator Holds a Lighted Carbon Lamp in His Hand, Then Walks Through the Carton and Emerges with a Lighted Mazda.

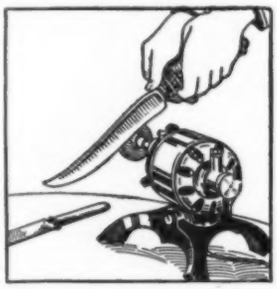
Window of the Denver Gas & Electric Light Company Which Won Fifth Prize—The Scene on the Left Shows a Room Lighted in the Old Way While the National Mazda Installation Is Shown in the Other.

NEW APPLIANCES

A Review of the Latest Developments and Information Respecting Electrical and Kindred Mechanical Appliances

Attachments for Making Sewing-Machine Motor More Useful.

The well known "Sew-E-Z" sewing-machine motor, made by the Hamilton Beach Manufacturing Company, Racine, Wis., has been greatly increased in usefulness by providing it with attachments that make it a general utility motor. This motor is a universal motor that can be used on alternating-current or direct-current circuits. It can readily be



Grinding Attachment Applied to Sew-E-Z Motor.

Buffing Attachment in Use on Sew-E-Z Universal Motor.

applied to any sewing machine and is very easily controlled by a pedal regulator.

A fan guard and blade set has been provided for ready attachment to the motor, making it a very convenient little fan, as shown in the adjoining illustrated fan section. A combination buffer and grinder has also been developed. This also can be quickly applied to make the motor available for buffing, polishing and grinding purposes that are so frequently desirable conveniences in the household kitchen. These attachments are procurable separately and make the motor a truly household utility.

Small Generator for Use on Motorcycle.

The General Electric Company, of Schenectady, N. Y., has developed and placed on the market a small generator for use on motorcycles to supply current for head and tail lights. This little generator is rated 23.5 watts, 7 volts, and in combination with a regulator, will hold this voltage practically constant through a wide range of speed. The generator is totally inclosed and therefore waterproof. It is geared to the engine shaft and at about 1,900 revolutions per minute, the generator cuts in on the storage battery, charging the battery at a three-ampere rate with full field excitation up to approximately 2,500 revolutions per minute. At this point the regulator begins to work and holds the current within five amperes up to 9,500 revolutions per minute. The outfit is very small and compact, and is equipped with ball bearings throughout.

Coles Electric Coffee Mills.

The combination coffee mill and meat grinder shown is a new model that has been placed on the market by the Coles Manufacturing Company, Philadelphia, Pa. The small size mill will granulate a pound of coffee in 40 seconds and can be connected to the ordinary electric light socket. It is operated by a one-fourth horsepower Westinghouse motor. This mill has obstruction release to clear the grinders, an indicating regulator which provides for six grades of coffee, a detachable hand crank for hand operation of the mill should current fail, and a self-cleaner and dustproof pan. It occupies a counter space of 12 by 17 inches, and is 27 inches high.

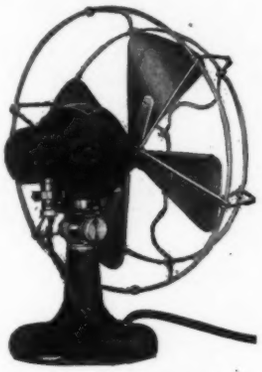
The double mill will granulate five pounds of coffee per minute, or pulverize one pound per minute. It is operated by a three-fourths horsepower motor. The motor operates both grinders at the same time. This mill has an automatic releasing and resetting device, self-cleaning heads, dustproof pans, indicating regulator which provides for 20 grades of coffee, and six-pound nickel hoppers. It is furnished for mounting on the counter or with pedestal base for floor mounting.

The combination coffee mill and meat chopper has a capacity of eight pounds of beef per minute, or will granulate two pounds of coffee per minute. It is operated by a three-fourths horsepower motor. All parts, including the bowl, are removable. The regular equipment consists of four sets of knives and plates, one sausage stuffing attachment, meat pusher, spanner wrench for chopper ring. Bone grinder, pulley, or tool grinder are also furnished, when desired. It occupies a counter space 30 by 32 inches and is 36 inches high.

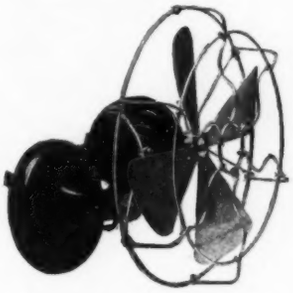
Combination Electric Coffee Mill and Meat Grinder.

Newest Types of Electric Fans

An Array of Representative New and Improved Types of Electric Fans Now Being Placed on the Market by the Leading Manufacturers to Meet the Needs of the 1917 Trade

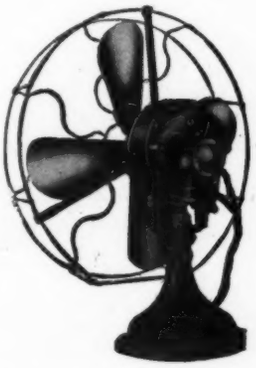


Eight-inch desk and bracket oscillator with universal motor for direct or alternating current. Also made non-oscillating. The Carleton Company.



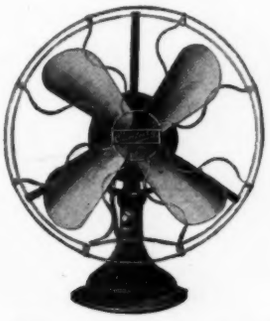
Six-inch light-weight fan with universal motor for desk or bracket use. Also made for low voltages. The Carleton Company, Boston, Mass.

New special blade shape to give noiseless operation of high-speed fans. Known by the trade name "Eck—ming." Eck Dynamo & Motor Company, Belleville, N. J.

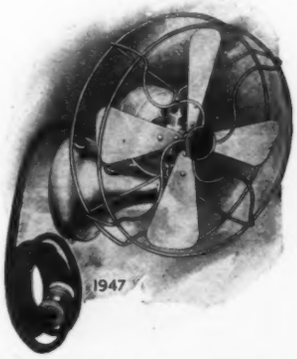


Century 16-inch oscillator with swivel and trunnion for desk or wall mounting. Alternating current only. Century Electric Company, St. Louis, Mo.

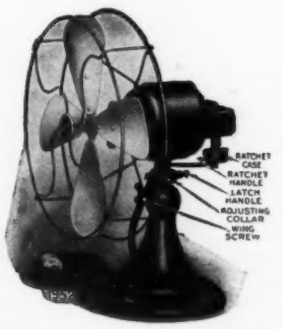
New Century 9-inch adjustable oscillator with drawn-steel motor frame, end brackets and stand, making a light-weight but strong fan. Century Electric Company.



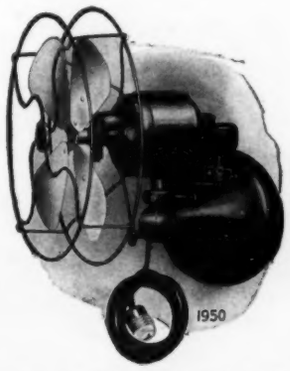
Century non-oscillating, adjustable-speed, 12-inch desk and bracket fan, of swivel and trunnion type. Also made in 16-inch size. Century Electric Company, St. Louis, Mo.



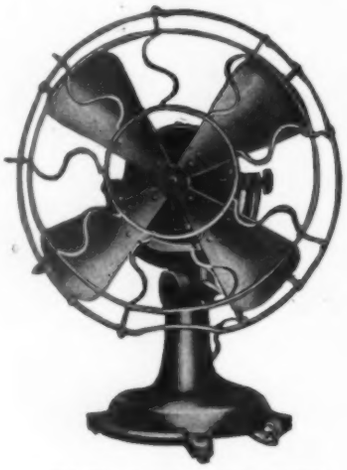
Northwind 8-inch, two-speed desk and bracket fan in wall position. Weight only four pounds. The Emerson Electric Manufacturing Company, St. Louis, Mo.



New Northwind, 10-inch three-speed oscillator. Has standard Emerson adjustable oscillating mechanism with safety device. The Emerson Electric Manufacturing Company.

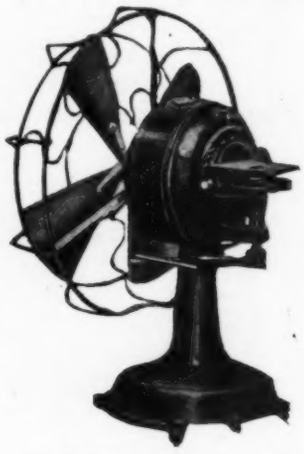


New Northwind 10-inch oscillating fan adjusted in bracket position. Fan operates on direct or alternating current. The Emerson Electric Manufacturing Company, St. Louis, Mo.

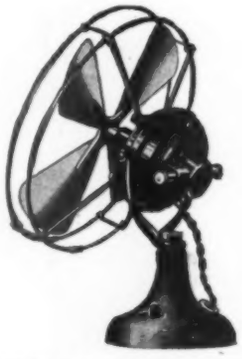


Fidelity direct-current swivel and trunnion desk and bracket fan. Made in 12 and 16-inch sizes. The Fidelity Electric Company, Lancaster, Pa.

Fidelity alternating-current trunnion 12 or 16-inch desk fan with commutator motor and three speeds giving wide variation. The Fidelity Electric Company.

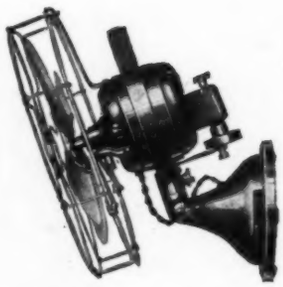


Alternating-current oscillating desk fan with three speeds. Made in 12 and 16-inch sizes. The Fidelity Electric Company, Lancaster, Pa.

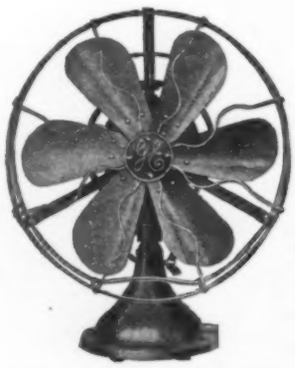


Eight-inch Fidelity universal fan for operating on either direct or alternating current. Adjustable for desk or bracket mounting. The Fidelity Electric Company, Lancaster, Pa.

General Electric alternating-current ceiling fan with 52-inch blades and regulating switch for three running speeds. A plain and sturdy type. Also made for direct current and 32 and 56-inch blades. General Electric Company, Schenectady, N. Y.

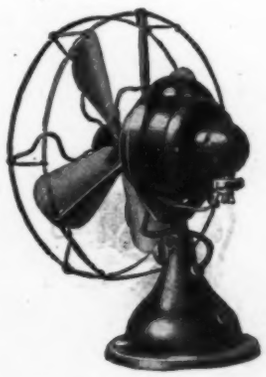


Twelve-inch four-blade oscillating desk and bracket fan. Made for direct current and also for alternating current; also in 16-inch size. General Electric Company, Schenectady, N. Y.



Six-blade oscillating table or bracket residence fan. Made in 12 and 16-inch direct-current and alternating-current types. General Electric Company.

General Electric six-blade ventilating outfit in 12 and 16-inch sizes. Made for direct current and also alternating current and provided with or without speed controller. General Electric Company, Schenectady, N. Y.



Nine-inch four-blade oscillating desk fan with hinge joint. Also made non-oscillating and for direct current. General Electric Co., Shenectady, N. Y.

New model of "Polar Cub" fan. A small and inexpensive but well built fan. The A. C. Gilbert Company, New Haven, Conn.

Rear view of Gilbert "Polar Cub" fan with die-cast frame. Fan is adjustable to any angle and has hook for attaching to wall.

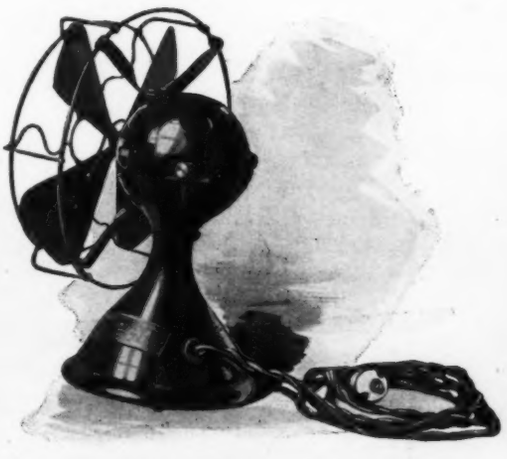
Eight-inch Chicago desk fan, non-oscillating upright rigid type with nickel and black finish. Lindstrom, Smith Company, Chicago, Ill.

Eight-inch adjustable Cyclone fan with universal motor and five speeds, substantial base and high nickel finish. Hamilton-Beach Manufacturing Company, Racine, Wis.

Sew-E-Z universal motor equipped with fan attachment (blade set and guard) making a convenient fan. Hamilton-Beach Manufacturing Company, Racine, Wis.

Improved eight-inch Breezer non-oscillating desk and bracket fan with speed regulator. Nickel and black finish. Lindstrom, Smith Company, Chicago, Ill.

New eight-inch oscillating universal desk and bracket fan with reliable oscillating mediumism and black finish throughout. Menominee Electric Manufacturing Company.



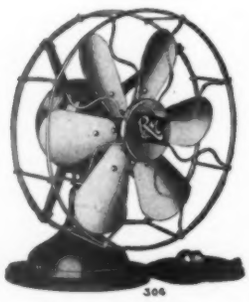
Eight-inch Menominee non-adjustable fan of rigid construction. Has universal motor for use on direct-current or alternating-current circuits. A strong, inexpensive fan. Menominee Electric Manufacturing Company, Menominee, Mich.

Table fan for use on dining-room or library tables to give all-around breeze. Menominee Electric Manufacturing Company.

Eight-inch universal two-speed fan for direct or alternating-current circuits; also furnished for low-voltage storage-battery circuits. The Robbins & Myers Company, Springfield, O.

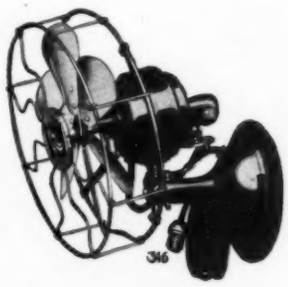
Ornamental ceiling fan for direct-current circuits. Also made in plain design. The Robbins & Myers Company, Springfield, O.

Nine-inch five-blade oscillator with universal series motor for use on direct current or alternating current, 100 to 120 volts. The Robbins & Myers Company Springfield, O.



Six-blade non-oscillating desk and bracket fan. Made in 12 and 16-inch sizes for direct current and for alternating current, all standard voltages. The Robbins & Myers Company.

Plain type alternating-current ceiling fan. Also furnished in ornamental design. The Robbins & Myers Company, Springfield, O.



Six-blade oscillator. Also made as four-blade fan, in 12 and 16-inch sizes for direct-current and for alternating-current circuits. The Robbins & Myers Company, Springfield, O.

Eight-inch Aerofan with universal motor and field-tap speed control. Has unique mahogany aeroplane-propeller-type blades. Russell Electric Company, Chicago, Ill.

Sprague four-blade, 56-inch ceiling fan with three-speed control. Sprague Electric Works of General Electric Company, New York, N. Y.

Sprague desk and bracket fan of single-field-coil type. Has new curved-edge type of blades. Made in 9, 12 and 16-inch sizes. Sprague Electric Works of General Electric Company.

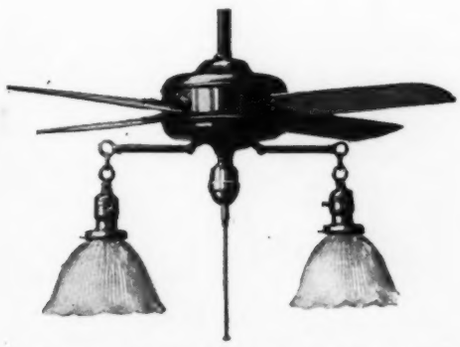
Sprague "Midget" 32-inch ceiling fan for direct current. Popular in hotel rooms in the South. Sprague Electric Works of General Electric Company, New York, N. Y.

Western Electric ceiling fan with adjustable blades for breeze control. Western Electric Company, Incorporated, New York, N. Y.

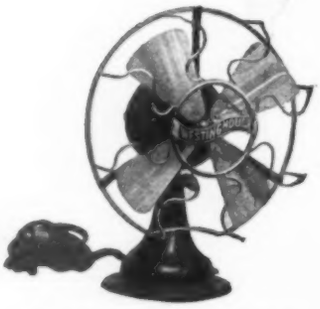
Improved Western Electric desk and bracket oscillating fan. Has new and simple adjustments and safety device. Provided with six rubber feet. Western Electric Company, Inc., New York, N. Y.

Improved Western Electric six-inch non-oscillating fan with knuckle joint for angle adjustment and for desk or bracket mounting. Now finished in statuary bronze. Western Electric Company, Incorporated, New York, N. Y.

Six-blade gyrating ceiling fan with semi-indirect lighting unit. These fans gyrate continuously, distributing their breeze over a large area. Westinghouse Electric & Manufacturing Company.

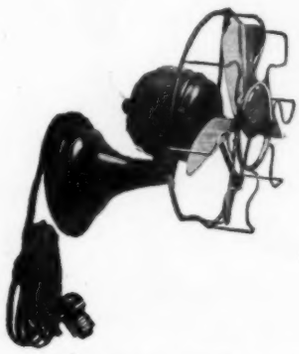


Alternating-current ceiling fan with two loop-and-link lighting units and pull-switch control. Blade sweep 32 inches. Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.



Four-blade eight-inch non-oscillating desk and bracket fan. Drawn-metal base and frame. Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.

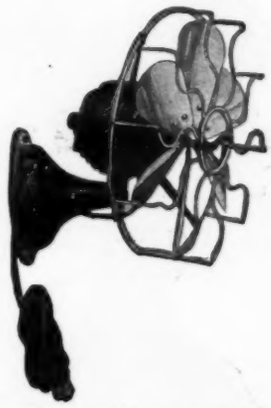
New "Whirlwind" eight-inch desk and bracket fan. A low-price single-speed non-oscillating fan of good construction. Black steel blades and guard. Westinghouse Electric & Manufacturing Company.



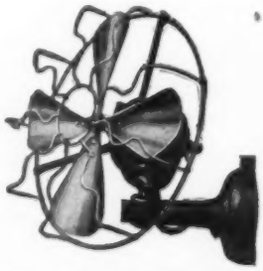
Four-blade eight-inch non-oscillating fan in bracket position. Drawn-metal frame and base give light weight and good finish. Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.

Counter-column gyrating fan with fans adjustable through 35 degrees. Also made as floor-pedestal outfit. Westinghouse Electric & Manufacturing Company.

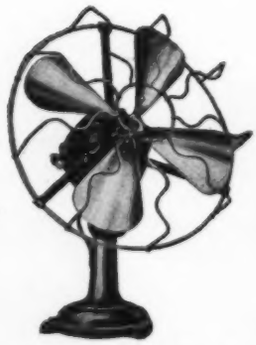
Four-blade 12-inch non-oscillating desk and bracket fan. Also made oscillating and in 10 and 16-inch sizes. Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.



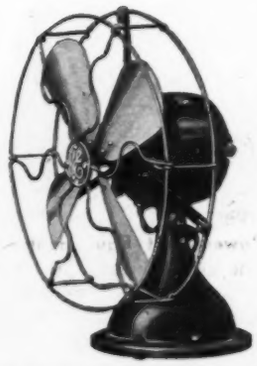
Six-blade 12-inch non-oscillating fan in bracket position. Also made in 16-inch size. A powerful and quick fan. Westinghouse Electric & Manufacturing Company.



Ten-inch non-oscillating universal fan with swivel and trunnion for bracket mounting and angle adjustment. Nickel-plated blades and guard. H. Boker & Company, Incorporated.



Ten-inch non-oscillating fan in desk position. Has two-speed universal motor for direct or alternating-current circuits. H. Boker & Company, Incorporated, New York, N. Y.



Hunter four-blade desk and bracket fan with speed adjustment. Made for direct current and for alternating current. Hunter Fan & Motor Company, New York, N. Y.

ACTIVITIES IN THE TRADE

Roth Brothers & Company, Adams and Loomis Streets, Chicago, Ill., manufacturers of electrical machinery, have announced to the trade an increase in list prices, to be effective February 5, on their products.

Stoneware Electric Stove Company, Dover, N. J., has opened branch offices in the Century Building, Denver, Colo., and at 279 Minna Street, San Francisco, Cal. H. A. Hibbard is in charge of the Denver sales office.

Thomas A. Edison, Incorporated, Orange, N. J., manufacturer of storage batteries, talking machines, etc., has acquired a tract of land consisting of about 10 acres on the Kearny meadows, fronting on the Hackensack River, as a site for a future plant.

The Electric Storage Battery Company, Philadelphia, Pa., will build a new eight-story, concrete plant, about 120 by 160 feet, at Nineteenth Street and Allegheny Avenue, to cost $500,000. Contract for erection has been awarded to William Steel & Sons Company, Philadelphia.

Nordberg Manufacturing Company, Milwaukee, Wis., manufacturer of engines, has issued a mailing folder descriptive of its recent achievements in engine building, particular reference being made to Uniflow and Poppet-Corliss engines for driving electric generators.

Diehl Manufacturing Company, Elizabeth, N. J., has issued bulletin No. 508, descriptive of its electrical absorption dynamometers. The bulletin deals with the construction and application of the dynamometers for testing automobile engines, pumps and various kinds of reciprocating machinery.

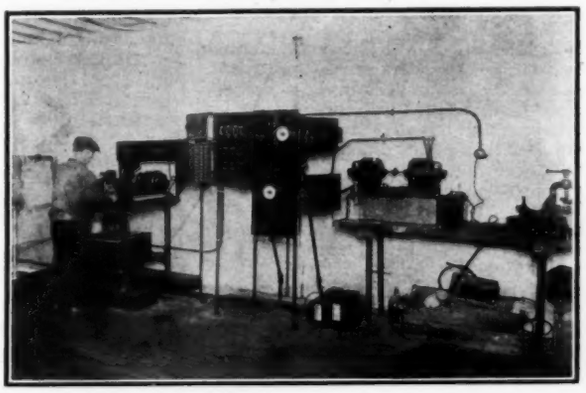
Representation for Electrical Manufacturers in Italy.—Ing. Stauble & Salvini, 76 Foro Bonaparte, Piazza Duomo, Via Dante, Palazzo Teatro Olimpia, Milano, Italy, wish to represent American manufacturers of electrical supplies, motors, lamps, measuring devices, telephone and traction material.

Kandem Electric Company, distributor for the **Menominee Electric Manufacturing Company,** announces the removal its offices to 58-60 Reade Street, New York City, where extensive lines of motors, fans, magnetos, arc and incandescent lamps, fixtures and other electrical apparatus are being carried.

Century Electric Company, St. Louis, Mo., has let a contract for the erection of a reinforced concrete warehouse containing about 15,000 square feet of floor space with terminal facilities and designed with special reference to handling sheet steel, shaft stock and other raw material. When completed the warehouse will be completed with modern appliances for handling heavy material. The new building has been necessitated in order to properly store and handle the large amount of raw material used in the production of the Century company's apparatus.

New Power-Plant Equipment Concern.—L. S. Shaw announces the establishing of the firm of L. S. Shaw & Company with offices in the Dime Bank Building, Detroit, Mich. The company will deal in power plant equipment, specializing in high grade apparatus. Mr. Shaw has had 15 years' experience in power-plant design, construction and equipment, having been with the Consolidated Gas Company, of New York, J. G. White & Company and the Edison Company of New York. For the past five years he has been manager of the power department of the Westinghouse Electric & Manufacturing Company's branch offices in Indianapolis, Chicago and Detroit.

Westinghouse Company Opens New Automobile Service Station in New York City.—Though deemed sufficiently large enough to take care of the demands made upon it for a long time to come, the service station opened in New York City by the Westinghouse Electric & Manufacturing Company two years ago has proved entirely inadequate, necessitating a move into larger quarters. A new station has been opened at 157 West Fifty-fourth Street, devoted exclusively to installing and caring for Westinghouse automobile electric starting, lighting and ignition systems. The ground floor is given over to a garage with working space for six cars and storage for as many more. Along the walls on this floor run two electric lines, one of low voltage for charging storage batteries, and another of 110 volts from which lamps, tools, vulcanizers and other devices may be operated. The shop is on the second floor, where there are a number of work benches, lathes, drill presses, grinders and other necessary tools. One of the most interesting pieces of apparatus on this floor is a device for testing generators. When a generator is brought in having symptoms that cannot be diagnosed by a careful inspection, it is removed from the car, clamped in this device, and driven by an adjustable speed motor. A series of meters mounted on a panel in front of the operator show clearly everything going on inside the generator under test, and the trouble, no matter how deep-seated or obscure, can be located immediately. This device is shown in one of the accompanying illustrations. At the right, in the same picture, is shown a small motor-generator set for transforming 110-volt direct current into low-voltage direct current for the battery charging line in the garage on the ground floor. The front part of the second floor is given over to offices, while the third floor is used for storage purposes. One of the important parts of the work of this station is the sale of new motors, generators, ignition coils, and parts and accessories, such as meters, fuses, lamps and switches. In order, therefore, to serve customers with the utmost dispatch, a retail counter has been installed, while behind it is a room stocked with every item and all parts of each item manufactured by the Westinghouse Automobile Equipment Department. At the present time nine men, all of them having special experience in the manufacture, installation and repair of electrical automobile equipment, are employed at this station.



Apparatus for Testing Generators in New Westinghouse Automobile Service Station.

PERSONAL AND BIOGRAPHICAL

MR. HARRY G. LOUSER, general superintendent of the Reading Transit & Light Company, at Lebanon, Pa.; and vicinity, has resigned, effective February 1, to devote his entire time to the Lebanon Electric Company, of which he is principal owner. He will be succeeded by MR. A. E. WARD, of Reading.

MR. HARVEY D. EATON, president of the Central Maine Power Company, recently spoke on "Rural Life," before a conference of the Commission, at Waterville, Me. He called attention to the variety of uses to which electricity can be put, to help the farmers in their work. He said the company has built 75 miles of rural line extensions during two years past, all financed by residents taking stock in the company.

MR. N. W. STORER was elected president of the Veteran Employees' Association of the Westinghouse Electric & Manufacturing Company, at its fourth annual banquet at the William Penn Hotel, Pittsburgh, on January 20. Mr. Storer has for a number of years been prominently identified with the railway electrification work which had been done by the Westinghouse company. Upon graduation from the Ohio State University in 1891, he took the student course of the Westinghouse company and was later in charge of electrical work in connection with the drafting department, and experimental and commercial testing. For a number of years he had charge of the engineering work in connection with direct-current motors and generators, subsequently becoming head of the railway engineering division, and is now devoting his entire time to railway electrification work. Mr. Storer has a wide acquaintance among the electrical fraternity, having been for a number of years very prominent in the work of the American Institute of Electrical Engineers, of which he is a past manager and vice-president. He has also been very active in the affairs of his college, having been president of the Ohio University Alumni Association.

N. W. Storer.

MR. C. E. BAGLEY, Reading, Pa., has been re-elected president of the Lehigh Telegraph Company.

MR. P. B. HARBAUGH has been appointed electrical engineer for the Salina (Kans.) Light, Power & Gas Company.

MR. A. H. S. CANTLIN, Quakerstown, Pa., has been elected president of the Quakerstown Traction Company, a subsidiary of the Lehigh Valley Transit Company.

MR. CARL JOHNSON, formerly connected with the municipal electric-lighting plant at Fort Atkinson, Wis., has become manager of the Janesville Electric Company's branch office in Edgerton, Wis.

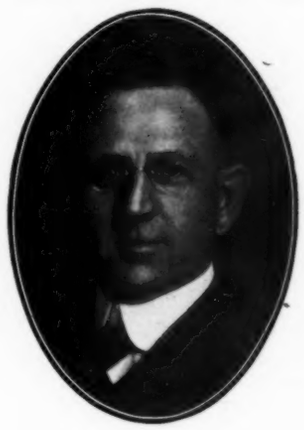
MR. H. T. GLOVER, for some time sales manager of the Esterline Company, Indianapolis, Ind., has resigned. Mr. Glover has not announced his new plans for the time being, but expects to establish a favorable connection in the near future. In the meantime may be addressed at 1841 North Talbott Street, Indianapolis, Ind.

MR. DOYLE JURNEY, local manager at Hickman, Ky., for the Kentucky Light & Power Company, has been made chief auditor of the company and will establish headquarters at Fulton, Ky. The company now owns and operates four plants in Kentucky, at Hickman, Fulton, Princeton and Dawson Springs. At Hickman Mr. Jurney will be succeeded by MR. BURNEY HUGHES.

MR. GARDNER ROGERS, general manager of the Houghton County Electric Light Company and the Houghton County Traction Company, Houghton, Mich., has been appointed manager of the Woonsocket, R. I., division of the Blackstone Valley Gas & Electric Company. This company is under the management of Stone & Webster, of Boston, as are the Houghton County companies.

MR. FREDERICK RIEBEL, Jr., formerly district sales manager of The George Cutter Company, South Bend, Ind., has just been made general manager of the Commercial Electric Supply Company, 42 Congress Street, East Detroit, Mich. Mr. Riebel, upon his graduation from Purdue University, in 1904, entered the employ of the Westinghouse Electric & Manufacturing Company, remaining with that company until February, 1911, at which time he became general manager of the South Bend Power Company, Bedford, Ind. In December, 1911, Mr. Riebel returned to the Westinghouse company becoming manager of its Omaha office, which position he retained until last January, at which time he took up his work with the Cutter company. The Commercial Electric Supply Company is one of the best known electrical houses of the Middle West, being one of the Westinghouse agent-jobbers, so that Mr. Riebel's previous experience has well qualified him for his new work, in which all his friends wish him great success.

MR. CHARLES A. FELKER, who recently was appointed country sales manager of the Central Electric Company, of Chicago, is one of the pioneers in the electrical field. In the early days he was identified with the construction and management of several electric-lighting plants in Iowa. In 1903 he entered the selling field as a representative of the Central Electric Company, with which he has been connected ever since. His recent appointment to the management of country sales evidences the esteem in which his work is held by his company and is also an indication of his popularity in the company's selling territory. Mr. Felker is one of the early Jovians, having been initiated in Oklahoma at the first rejuvenation held outside of Texas and the third in the history of the organization.



C. A. Felker.

MR. J. J. MOLYNEAUX has been appointed auditor for the southwestern utility properties of H. M. Byllesby & Company.

MR. THOMAS N. McCARTER, of the Public Service Corporation, Newark, N. J., will sail about February 10 for a pleasure tour of the British West Indies, Cuba, Panama and Costa Rica, returning in about two months.

MR. HALBERT P. HILL has become associated with MR. FRED OPHULS and MR. J. H. McCREERY under the firm name of Ophuls, Hill & McCreery, Inc., which will conduct a consulting engineering business at 112 West Forty-second Street, New York City. Mr. Hill was connected with the Allis-Chalmers Company for several years and later has been a consulting engineer with offices in New York City and specializing in electrical apparatus, steam turbines and producer-gas equipment. Messrs. Ophuls and McCreery are well known to the engineering profession, especially in the refrigeration field. The new firm will devote most of its time to the design of electric light and power plants and particularly refrigerating and ice-making equipment in connection with such plants.

MR. EMIL ANDERSON, who was elected president of the Western Association of Electrical Inspectors, at its convention last week, is a resident of Minneapolis, Minn., where for the last ten years he has held the position of electrical inspector for the Minneapolis Underwriters' Inspection Office, now a branch office of the General Inspection Company. Previous to this Mr. Anderson was for several years chief engineer for the Yellowstone Park Association, having general charge of the heating and lighting plants and water supplies for its various hotels. He is a graduate of the Electrical Engineering Department of the University of Minnesota, class of 1905. He is a member of the American Institute of Electrical Engineers, during 1914-1915 serving as secretary for the Minnesota Section. Mr. Anderson has taken a very active part in all electrical organization affairs in Minneapolis, having served as president of the Minneapolis Electric Club, etc. In Jovian affairs he has filled the position as Jupiter on the degree team, and for the present year he holds the commission of Second Tribune for his home district. Two years ago when the Western Association of Electrical Inspectors held its convention in Minneapolis, Mr. Anderson was chairman of the Committee of Arrangements. Shop inspections in Minneapolis for the Underwriters' Laboratories and field follow-up work has been left largely in Mr. Anderson's charge for the past seven or eight years. In the organization to whose leadership he was called by the recent election at Toledo, he has taken a very active part as a member of the executive committee, as vice-president, chairman of the committee on electric signs, and chairman on the committee on concentric wiring. Mr. Anderson has had a rather unusual opportunity to study the needs of this organization. In his reply to the address of welcome by Mr. Latson, representing Mayor Milroy, of Toledo, he called attention to the importance of not only sending electrical inspectors to the annual conventions, but also to the need of giving them financial and other support sufficient to keep them from leaving this field of work. Due to his activity in various organizations Mr. Anderson has a very large circle of friends, who will be glad to learn of his election to the presidency of this important organization.

Emil Anderson.

MR. H. O. EVANS, Pittsburgh, Pa., has been elected vice-president of the Ephrata & Lebanon Street Railway Company, Lebanon, Pa.

MR. H. M. SHICKEL, formerly connected with the Montgomery (Ala.) Light & Water Power Company, has been made superintendent of the Alliance (O.) Gas & Power Company. Both of these companies are operated by Henry L. Doherty & Company, of New York City.

MR. BYRON T. BURT, retiring manager of the Rutland (Vt.) Railway, Light & Power Company, was recently the recipient of a gift of a diamond and pearl stick pin and gold cuff links from company employees, in token of their esteem. MR. JAMES O'BRIEN, who recently resigned as auditor, was presented with like tokens by his office force.

MR. J. F. McLAUGHLIN, for four years private secretary to MR. ALFRED T. TOWNSEND, who until lately was local manager of the Blackstone Valley Gas & Electric Company, Woonsocket, R. I., and is now manager of Stone & Webster properties, at Beaumount, Tex., will remove to that place and assume similar duties in Mr. Townsend's new office.

MR. F. W. BACON, vice-president of the Lexington Utilities Company and of the Kentucky Traction & Terminal Company, at Lexington, Ky., will go, on February 1, to Philadelphia, where he will become director of various properties of Chandler & Company, owners of the Lexington properties. He will continue as vice-president of the Lexington organization, of which MR. S. P. DAILEY was recently made general manager.

MR. G. Y. WATT, formerly in charge of the Rochester (N. Y.) sales office of the Century Electric Company, of St. Louis, Mo., has been transferred to the new sales office opened at 10 High Street, Boston, Mass. MR. J. F. ELLIOTT and MR. H. P. WESTERVELT will assist him in Eastern sales work. MR. G. H. LINDSEY, formerly connected with the St. Louis office of the company, has been placed in charge of the Rochester office and the home office sales organization has been increased by the addition of MR. E. S. MOORE, who will have charge of the fan department.

MR. D. W. HOPPER, for many years well known in the electrical industry, has returned to Chicago and is at present making his headquarters at 6027 Prairie Avenue. Mr. Hopper was for several years employed as salesman for the Brilliant Electric Company and the Tungstolier Company, of Cleveland, traveling in Ohio and Michigan. He also was connected with the Western Electric Company out of the Pittsburgh office, covering Eastern Ohio for two years and later on covered the same territory for the Central Electric Company, of Chicago. Mr. Hopper has also been connected with the commercial department of the Bell Telephone Company, of Michigan.

OBITUARY.

MR. HARRY R. SWANN, who for 51 years was in the employ of the old Louisville (Ky.) Gas Company, one of the predecessors of the Louisville Gas & Electric Company, is dead at the age of 85 years. He was general inspector for the old company for many years.

MR. HENRY C. HENLEY, for 20 years chief inspector of the St. Louis Fire Prevention Bureau, fell dead on the morning of January 20, in Forest Park, St. Louis, having left his office in the Pierce Building, at 10 o'clock. Mr. Henley had been suffering from arterio-sclerosis for several years. He was 59 years old, and since 1881 had been active in fire-prevention measures.

MR. JOHN JOYCE, a leading figure in public utility management in Massachusetts, died at his home at Beverly Hills, Cal., January 26, aged 68 years. His summer home was at Andover, Mass. Mr. Joyce was a conspicuous example of a self made man. He was born in Limerick County, Ireland, and coming to the United States in 1862, settled at Laurence, Mass. He started work as clerk, and after 15 years entered business for himself. He organized the Shawinigan Water & Power Company, of Canada, in 1897, and later became president and director of various Massachusetts lighting companies, the Attleboro Steam & Electric Company, Dedham & Hyde Park Gas & Electric Company, and several gas companies. He was vice-president of the Gillette Safety Razor Company, furnishing much of the capital for the expansion of the business. He was also a director in the Curran & Joyce Company and president of the Lake Superior Iron & Chemical Company.

MR. ROBERT S. ORR, vice-president and general manager of the Duquesne Light Company, of Pittsburgh, Pa., and one of the best known electrical engineers in the country, died January 24 at his residence at Pittsburgh after a brief illness, aged 49 years. Mr. Orr was born in Clarion County, Pa., and was a graduate of Washington and Jefferson universities. He engaged in teaching for a number of years, after which, in 1904, he accepted a position as contract agent for the Allegheny Light Company, which later became the Duquesne Light Company. He was appointed general superintendent

R. S. Orr.

of the latter company and later vice-president and general manager. Mr. Orr was active in the National Electric Light Association, having been a member of its executive committee for a number of years. He was a member of American Institute of Electrical Engineers, a past-president of the Pennsylvania Electric Association and a member of the Engineers' Society, of Western Pennsylvania.

CURRENT ELECTRICAL NEWS

Weekly Record of Construction Activities

EASTERN STATES.

AUGUSTA, ME.—H. B. Whipple, of Lewiston, advocates the development of 50,000 horsepower in hydroelectric generation by the state, on the east branch of the Kennebec River for supply to Portland, Bangor and other communities. Mr. Whipple calls the water powers the state's most valuable resource. There are three falls on the east branch, with good foundations for dams.

YARMOUTH, ME.—A bill has been introduced in the Maine Legislature which would enable this town to acquire a municipal electric and gas plant to supply Yarmouth, North Yarmouth and Pownal. Provision is made for the purchase of the Yarmouth Lighting Company's plant if the latter should desire to sell.

BARRE, VT.—The Central Power Corporation, which is negotiating with the City Council for a franchise to do business here, wishes to have a penalty clause removed, whereby the company would not be subjected to $1,000 forfeit on non-completion of the transmission line by 1920, and seeks the right of appeal to the Public Service Commission in case of disagreement.

EAST BOSTON, MASS.—The installation of a white-way system on Meridian Street is contemplated by city officials.

WEBSTER, MASS.—The Webster & Southbridge Gas & Electric Company has ordered a 3,200-kilowatt turbogenerator which will be delivered this winter. Other station improvements will be made.

WESTFIELD, MASS.—A committee to investigate the municipal electric and gas plant has had William Plattner, consulting engineer of Boston and manager of the North Attleboro electric municipal plant, investigating the physical plant and the management of the local utility. He will report to the town next month. The selection of Mr. Plattner was with the approval of the State Gas and Electric Light Commission.

NEW MILFORD, CONN.—Preparatory to constructing an immense dam across the Housatonic River near Southville, John H. Lancaster of Litchfield, Conn., and others have brought condemnation proceedings against several owners of land along the Housatonic River here and in the nearby town of Brookfield. The company, of which Mr. Lancaster is the representative head, proposes to establish a power plant to manufacture and distribute electricity over a large area. The estimated cost of the dam is about $1,000,000, and the plans call for a concrete structure 980 feet long, 40 feet high and 45 feet in thickness at its base.

PROVIDENCE, R. I.—A substation will soon be built by the Rhode Island Company at Harmony, R. I.

AUBURN, N. Y.—The Common Council is considering the appointment of a special committee to investigate the feasibility of a municipally owned electric-lighting plant.

BAINBRIDGE, N. Y.—The Standard Light & Power Company is considering plans for the construction of an electric-lighting plant here.

BINGHAMTON, N. Y.—Preliminary plans have been completed by the Binghamton Light, Heat & Power Company for its new substation on Noyes Island. These plans contemplate the building of a combination substation, garage and storeroom, which will materially improve operating conditions and centralize all work in one location. The present plans call for a brick building 80 by 70 feet.

ESPERANCE, N. Y.—The Schoharie Valley Light & Power Corporation has been incorporated with $100,000 capital stock to manufacture and distribute electricity in this locality. The incorporators are F. M. Lauders, E. C. Grantier and B. Grantier, of this city.

NEW HARTFORD, N. Y.—The Town Board contemplates the installation of 75 250-candlepower lamps in a new lighting district recently organized.

PORT CLINTON, N. Y.—A new 300-kilovolt-ampere motor-generator has been installed by the Port Clinton Electric Light & Power Company to furnish 60-cycle current to the city, increasing the capacity of the plant to 465 kilowatts.

SAYVILLE, LONG ISLAND, N. Y.—The Atlantic Communication Company, 47 West Street, New York, will build six self-supporting steel towers, 800 feet high. Bids are being asked on the work.

TOTTENVILLE, STATEN ISLAND, N. Y.—The Richmond Light & Railroad Company has made application for permission to install a new pole line, with lighting circuit, on the Richmond turnpike.

ATLANTIC CITY, N. J.—The Bell Telephone Company has had plans prepared for a new five-story fireproof exchange building at Pacific and Mt. Vernon Avenues.

CLAYTON, N. J.—The South Jersey Gas Company has acquired the electric-lighting plant formerly operated by the Moore Glass Company, with a franchise for furnishing electric energy in the borough.

IRVINGTON, N. J.—In connection with the establishment of a municipal waterworks, as urged in a report of Isaac J. Casey, Town Engineer, it is proposed to install a pumping plant to cost $90,500. The complete plant and system is estimated to cost $600,000.

McAFEE VALLEY, N. J.—The Bethlehem Steel Company, South Bethlehem, Pa., will build a new power plant at its local limestone quarries.

NEWTON, N. J.—The Newton Electric & Gas Company has submitted a proposition to the Town Committee for the installation and operation of an electric street-lighting system, replacing the present gas lighting.

UNION, N. J.—The Union Township Committee has voted to extend the street-lighting system by the installation of additional lights.

WENONAH, N. J.—The Common Council is considering the installation of an electric-lighting system. A five-year gas-lighting contract with the New Jersey Gas Company expired February 1.

ABINGTON, PA.—The Board of Township Commissioners has made an appropriation of $8,000 for street lighting during 1917.

CONSHOHOCKEN, PA.—The Counties Gas & Electric Company, Philadelphia, has acquired property along the Schuylkill River for the erection of a new 1,000-horsepower plant for local service.

DOVER, PA.—The Dover-Rossville Transit Company has completed construction work on a trackless trolley line between Dover and Rossville, the first such line in the state, and plans for immediate operation.

LEBANON, PA.—The Lebanon Milling Company is planning for the electric operation of its grist mill at Independence, recently acquired. The former steam plant will be superseded by central-station service.

PHILADELPHIA, PA.—On January 21, fire in the plant of the William Adams Foundry Company, North Ninth Street, destroyed a section of the power house. The total loss is estimated at $20,000.

PHILADELPHIA, PA.—The Colonial Knitting Mills, Inc., will build a power plant for mill operation in connection with its new knitting works on property recently acquired on Twenty-fifth Street. Harry A. Norris is secretary and treasurer.

PHILADELPHIA, PA.—The Philadelphia & Reading Railroad will build a new power house at its Emerald Street yards; a new four-ton traveling crane will also be installed. Bids received up to February 8. Samuel T. Wagner, Philadelphia, is the architect.

PHILADELPHIA, PA.—In connection with improvements to the city waterworks, the Water Bureau is planning the following work: new auxiliary pumping station, Lardner's Point, to cost $750,000; new filtering plant and pumping station at Torresdale, to cost $1,500,000 and $750,000, respectively.

READING, PA.—The Metropolitan Electric Company, operating in Reading and vicinity, has constructed nearly 100 miles of transmission lines during the past year in the territory served by that company and the Reading Transit & Light Company. Connections have been made with the properties of the American Gas Company at Pottstown and the United Gas Improvement Company at Norristown. Construction is well along on the transmission line of the Reading Transit & Light Company at Lebanon, Pa., which, it is expected, will be finished early in the spring.

SWEDELAND, PA.—The Alan Wood Iron & Steel Company, Philadelphia, is planning for the construction of an electric crane with capacity to lift a loaded freight car at its local furnace properties.

TULLYTOWN, PA.—The Borough Council is planning for the installation of an electric system for street-lighting and house service. A petition is being circulated to obtain data as to the number of consumers.

WAVERLY, PA.—The Sayre (Pa.) Electric Company has signed a new five-year street-lighting contract with the Village Council. The contract covers the installation of 150 100-candlepower, 30 150-candlepower and two 250-candlepower gas-filled lamps.

WAYNE, PA.—The Radnor Township Commissioners are negotiating with the Counties Gas & Electric Company for the installation of new 32-candlepower street lamps of improved type to replace the present 16-candlepower carbon lamps.

WILKES-BARRE, PA.—The Luzerne County Court has refused the application of residents to authorize the City Council to reconsider the lighting contract recently awarded to the Wilkes-Barre Company. Following the award of such contract the Wilkes-Barre Light Company, a new organization, tendered an offer to supply service at a reduced rate, and citizens filed a petition with the court.

WILLIAMSPORT, PA.—Fire on January 16 destroyed the electrical department of the Sweet's Steel Company, with loss, including machine and pattern shops, of about $25,000.

HAMPTON, VA.—A charter has been issued to the Hampton & Langley Field Railway Company for the construction of a four-mile electric railway from Hampton to the Langley aviation field. J. W. Shanahan is interested in the project.

GREENVILLE, N. C.—The city has engaged Gilbert C. White, of Durham, to prepare plans and supervise the construction of improvements to the electric-lighting plant.

SPRING HOPE, N. C.—The city contemplates voting on $50,000 bonds, part of the proceeds of which will be used for improvement of the electric-lighting system.

NORMAN PARK, GA.—The Norman Institute will rebuild the electric-lighting plant recently destroyed by fire. T. E. Howell is superintendent.

SUMMERVILLE, GA.—C. C. Cleghorn and S. C. Martin are interested in the organization of a company to build an electric-lighting plant, to cost about $5,000.

HOMESTEAD, FLA.—Bids are being received here for the construction of a municipal electric-lighting plant.

NORTH CENTRAL STATES.

AKRON, O.—The Northern Ohio Traction & Light Company is installing a 20,000-kilowatt generator in its power plant here, and a second unit of the same capacity has been ordered and will be in operation in June. About 4,000 horsepower additional boiler capacity will be installed in the latter part of the year. The transmission and distributing lines of

the company in the Canton-Akron district are to be extended materially this year.

BLUFFTON, O.—The question of issuing $25,000 in bonds to remodel the electric-lighting and waterworks plants will be submitted to vote March 6.

DAYTON, O.—The Dayton Power & Light Company will erect a service line on the Smithville and Marshall roads in Van Buren Township to supply energy to farmers in that section.

JAMESTOWN, O.—The Dayton Power & Light Company has concluded arrangements for the purchase of the Jamestown Electric Light Company for $20,000 and the payment of its indebtedness. Plant improvements will be made.

MILFORD, O.—The Miami Light, Heat & Power Company is planning the installation of an electric-lighting plant here, construction on which will be started in the spring.

SPRINGFIELD, O.—It is reported the Springfield Light, Heat & Power Company plans to build a new power plant. Wade Parsons is manager of the company.

CORYDON, IND.—The Interstate Public Service Company, of which the public utilities of New Albany and Jeffersonville are a part, is contemplating the establishment of a hydroelectric plant on Blue River at White Cloud, eight miles west of Corydon. The project will involve the expenditure of $1,000,000. James W. Dunbar is manager of the company at New Albany.

EVANSVILLE, IND.—The Indiana Public Service Commission has given its approval to transfer of the property of the Evansville Public Service Company to the Evansville Public Utilities Company, the latter organization now operating the city street car lines, the traction line to Princeton, Ind., and the local gas and electric light plants.

FERDINAND, IND.—The Electric Light & Power Company has been incorporated with a capital of $10,000 to furnish electric service here. W. R. Sauer is manager of the new company.

LA CROSSE, IND.—The La Crosse Electric Company will be incorporated with a capital of $5,000 by Charles Kimble, of the Kimble Electric Company, La Crosse.

SULLIVAN, IND.—Substantiation in part of the reports that a large hydroelectric plant is to be built on Blue River at White Cloud, Ind., is contained in a statement from John C. Chaney, of Sullivan, that he has been taking options on the site and other property which will be required in connection with the project. Mr. Chaney declines to identify the interests he is representing, although he stated that he was not working in behalf of the Interstate Public Service Company. He has secured options on numerous farms along the river in his name and the name of Samuel A. Tescher, providing for purchase of the land at any time at stated prices before January 1, 1918.

TERRE HAUTE, IND.—The Board of Park Commissioners is receiving bids for the installation of boulevard lighting systems in Voorhees Park and Memorial Park. J. D. Fitzpatrick is superintendent of the board.

CAMBRIA, ILL.—The Cambria Light, Heat & Power Company has been incorporated with a capital of $2,500 to furnish electric service here. J. J. Thomas is manager.

CICERO, ILL.—The Town Board has voted to postpone the receiving of bids for the sale of the local electric-lighting plant until February 26, the reason being stated that there was only one bid submitted for the plant.

DE KALB, ILL.—The De Kalb Light & Power Company has been incorporated with $6,500 capital stock by H. L. Graves and others of this city. The company plans the erection of extensive service lines.

BROOKLYN, WIS.—The Village Trustees have granted a franchise to the Brooklyn Electric Company, which will install a distribution system.

CUMBERLAND, WIS.—A franchise has been granted to the Clear Lake Electric Company for furnishing electrical energy for street lighting and private consumption for lighting town.

LAKE MILLS, WIS.—The Business Men's Association contemplates the installation of a cluster lighting system on Main Street.

MERRIMACK, WIS.—The towns of Merrimack, Sumpter and Prairie du Sac are planning to erect local distribution systems and transmission lines to connect with the hydroelectric plant at this place.

DATES AHEAD.

American Institute of Electrical Engineers. Mid-winter convention, New York City, February 7-9. Secretary F. L. Hutchinson, 63 West Thirty-ninth Street, New York City.

New Mexico Electrical Association. Annual convention, Albuquerque, N. M., February 12-14. Secretary pro tem., E. A. Thiele, Roswell, N. M.

Wisconsin Electrical Association. Annual meeting, Hotel Pfister, Milwaukee, Wis., March 15-16. President, W. E. Haseltine, Ripon, Wis.

Tri-State Water and Light Association of the Carolinas and Georgia. Annual convention, Macon, Ga., April 17-19. Secretary, W. F. Steiglitz, Columbia, S. C.

Southwestern Electrical and Gas Association. Annual convention, Dallas, Tex., April 26-28. Secretary, H. S. Cooper, 405 Slaughter Building, Dallas, Tex.

Arkansas Association of Public Utility Operators. Annual convention, Pine Bluff, May 16-18. Secretary-treasurer, R. B. Fowles, Pine Bluff Company, Pine Bluff, Ark.

Electric Supply Jobbers' Association. Semi-annual meeting, Homestead Hotel, Hot Springs, Va., May 22-24. Secretary, Franklin Overbagh, 411 South Clinton Street, Chicago, Ill.

NEWBURG, WIS.—H. F. Weber is considering plans for the construction of an electric-lighting plant to supply electric service in Newburg, Boltonville, Saukville and other villages in this vicinity.

BADGER, MINN.—Citizens here are interested in a movement to install an electric-lighting plant.

CROSBY, MINN.—There is a movement on foot here for the installation of a municipal electric-lighting plant.

DULUTH, MINN.—The City Commissioners have authorized the installation of a number of additional units to the street-lighting system.

MOUNTAIN IRON, MINN.—Bids are being received for furnishing the village with equipment for a street-lighting system.

ST. PAUL, MINN.—The installation of an ornamental lighting system in Robert Street, between Eighth and Central Avenues, has been approved by the Council. Plans are also being considered for the installation of ornamental lamps in Rice Street.

ZIMMERMAN, MINN.—A franchise has been granted to the Elk River Power & Light Company to furnish electric service here.

CLARINDA, IOWA.—It is possible that the Iowa & Southwestern Railway, extending from Blanchard to this city, will be electrified. William Orr, of this city, is interested.

DUNLAP, IOWA.—An explosion in the electric-lighting plant here caused a fire which totally destroyed the building. The plant was owned by the Gas & Electric Company with headquarters at Missouri Valley.

MANILLA, IOWA.—Bonds in the sum of $5,000 have been voted for an electric light and power plant here.

McCRACKEN, KANS.—A bond issue of $30,000 for a municipal electric-lighting and waterworks plant carried at a recent election.

MANHATTAN, KANS.—The stockholders of the Manhattan City & Interurban Railway Company voted to issue $200,000 in bonds to pay indebtedness and to make extensive improvements. W. R. West is president of the company.

PIERRE, S. D.—The development of hydroelectric possibilities of the Missouri River in South Dakota is the purpose of the South Dakota Hydroelectric Corporation which has filed articles of incorporation. George W. Adams, of Council Bluffs, Iowa, is at the head of the new company, which is capitalized at $15,000,000. The head offices of the company will be maintained at Kimball, S. D.

KENSAL, N. D.—Plans are being considered for the installation of an electric-lighting plant here. Anton Feckler is interested.

SOUTH CENTRAL STATES.

COVINGTON, KY.—There is a probability that this city will erect a municipally owned electric-lighting plant. In 1898 the people voted a bond issue of $75,000 to erect a municipal plant but no attempt was ever made to apply it.

GREENSBURG, KY.—The electric light plant and franchise and the plant and property of the Moss Milling Company here will be sold at auction on February 12.

LOUISVILLE, KY.—The Kentucky Utilities Company has filed amended articles of incorporation increasing its capital stock from $3,000 to $8,000 and fixing Louisville as the principal office.

LOUISVILLE, KY.—C. H. Moore, of Chicago, president of the Warehouse Architectural & Engineers Company, of Chicago, has announced plans for immediate construction of a large terminal warehouse in Louisville, to cost $2,500,000. Electrically driven equipment will include trucks, elevators, and equipment for manufacturing plants which it is proposed to locate in the structure.

MURRAY, KY.—The contract for construction of the municipal lighting plant has been let to W. E. King, of Covington, Tenn., who will begin work as soon as the money is available. The city voted $20,000 of bonds for which no satisfactory bids have been received as yet. It is expected that the issue will be readvertised and that sales will be realized later. Meanwhile the city is without street lights, the local company having declined to continue service at the old rates on the ground that the cost of operations has increased. The company has proposed that the lights be turned off at 11:30 p. m. and paid for at the old basis, but the city has declined to accept the proposition.

PRINCETON, KY.—Notice of dissolution of the Princeton Electric Light & Power Company, which has been taken over by the Kentucky Light & Power Company, is given by W. J. Holman, general manager.

BRISTOL, TENN.—J. H. Grayson and associates are making preparations for construction of a hydroelectric plant in the Watauga River, five miles west of Elizabethton, Tenn. Mr. Grayson states that he has acquired by purchase the necessary water rights and lands and that work of construction will begin in the early spring. The energy generated will provide power for the industries of Elizabethton and vicinity.

BRISTOL, TENN.—The Old Dominion Power Company is the name of a new concern chartered under the laws of Virginia, with an authorized capital stock of $500,000, that on February 1 took over and consolidated several electric plants in Wise County, Va., and will begin the operation of these plants from a central power station at Dorchester. The companies to be consolidated by this plan are the Norton Light & Power Company, the Coeburn Light & Power Company, the Glamorgan Light & Power Company, the Norfolk Water Company and the New York Mining & Manufacturing Company. D. Terpstra, of Dorchester, is president and manager of the new company.

CHATTANOOGA, TENN.—The Cincinnati, New Orleans & Texas Pacific (Queen & Crescent) Railroad is reported to be contemplating electrification of its line from Cincinnati to Chattanooga. Involved in the project would be establishment of two hydroelectric power plants, one on the Dix River near Danville, Ky., and the other at Cumberland Falls on the Cumberland River.

CLARKSVILLE, TENN.—A resolution has been introduced in the City Council by Alderman John Danel, providing that the city ask the State Legislature to sanction a bond issue to provide funds for the establishment of a municipal lighting plant. The Clarksville Electric Company is now supplying the community, not operating its plant, but purchasing current from the Kentucky Lighting Co., with a power plant at Hopkinsville, Ky. A bond issue of $100,000 is projected.

KINGSPORT, TENN.—At a cost of $350,000 the Clinchfield Portland Cement Company is completing a power house at Kingsport, which will supply the company's plant, the city and industrial concerns.

EARLE, ARK.—The Earle Light, Water & Ice Company is preparing plans for the installation o fa modern electric-lighting plant to replace the one recently destroyed by fire.

ALICE, TEX.—Morrison & McCall, of St. Louis, Mo., have purchased the electric light and power plant here of the Alice Cotton Oil Company. The new owners plan to greatly enlarge the plant and to construct electric power transmission lines to San Diego and a number of other towns of this section.

DUBLIN, TEX.—The City Council has granted a franchise to the Texas Power & Light Company. A transmission line will be built to this place from Comanche, a town about 30 miles west of here.

GATESVILLE, TEX.—The electric light and power plant of the Gatesville Power & Light Company, which was recently destroyed by fire, entailing a loss of about $75,000, will be rebuilt. J. R. Raly is president.

JACKSBORO, TEX.—The Mill & Elevator Company, which recently purchased the local electric light plant from the Jacksboro Light Company, will install new machinery and make other improvements.

KOSSE, TEX.—The Kosse Light & Power Company will install an electric light and power plant here at a cost of about $12,000. The stockholders are L. T. Gibbs, W. D. Allen and W. E. Allen, all of Kosse.

WICHITA FALLS, TEX.—The Wichita Falls Electric Company, a subsidiary of the Strickland interests, has announced that work would start shortly on a power line to Henrietta, 18 miles east of here. The Henrietta property was recently acquired by the Strickland interests for $12,500 and that town will be the fourth Northwestern Texas community to be supplied with power by the company, the others being Iowa Park, Electra and Burkburnett.

WESTERN STATES.

HELENA, MONT.—The Western Union Telegraph Company will construct a trunk telegraph line between Helena and Minneapolis, Minn.

MISSOULA, MONT.—The Clark-Missoula Power Company has been formally dissolved by a court decree. The company sold energy to the Missoula Light Company and to the Missoula Street Railway Company and in the future the light company will handle the distribution of energy for itself and for the railway company. The change was made to reduce administration expenses.

RICKEY, MONT.—Fred Lucksinger of Lambert, Mont., will install an electric lighting plant here.

SENORITO, N. M.—The J. G. White Engineering Corporation of New York City, has been awarded a construction and engineering contract by the Senorito Copper Corporation, of Senorito, in the Nanciemento District, 90 miles northwest of Albuquerque. The contract covers the installation of a mill and power plant, a two-mile tramway, necessary mining machinery and equipment of the company's coal mine to produce fuel for the power plant. Initial installation will be for production capacity of 250,000 pounds of copper per month. Active work has been started and construction is being rushed in order to take advantage of the high price of the metal. The mill and plant embody some unusual features enabling the production of refined copper at the mine and eliminating the necessity of transporting the ore. This will be accomplished by the Greenawalt electrolytic method of leaching and electric deposition.

SALT LAKE CITY, UTAH.—The Utah Power & Light Company is planning to rebuild its Olmstead power plant at an estimated cost of $350,000. The capacity of the new plant will be 8,000 horsepower. The company is also planning to reconstruct a 25-mile section of its interstate trunk line, to provide for the extra load now demanded, in Eureka, Bingham, Arthur, Helper, Magna, Garfield and other towns. The cost of this work is estimated at about $90,000.

MONROE, WASH.—The City Council is considering a proposal of the Western Light & Power Company, of Washougal, to furnish electric service here.

HOOD RIVER, ORE.—The Pacific Power & Light Company is planning to run a cable line across the Columbia River to connect its power plants on Hood River and White River with that on the White Salmon River at Husum, Wash.

Proposals

LIGHTING FIXTURES.—Bids will be received until February 8 by the Auditorium Commission, Savannah, Ga., for the installation of electric-lighting fixtures in the Municipal Auditorium Building. Plans and specifications are on file in the office of the architect, 23 Abercorn Street, to whom requests for further information may be addressed.

LEAD-COVERED CABLE.—Bids will be received until February 7 by the South Park Commissioners, Fifty-seventh Street and Cottage Grove Avenue, Chicago, Ill., for 22,000 feet of No. 6 single-conductor, cloth-insulated, 5,000-volt lead-covered cable, delivered to 5818 Cottage Grove Avenue. Specifications can be obtained at the Commissioners' office.

ELECTRICAL CONSTRUCTION. — Bids will be received by C. C. Aldridge, City Clerk, La Grange, N. C., for materials and labor in connection with the construction of a 22,000-volt power transmission line about 12 miles in length, substation, arc light and distributing systems. Plans and specifications are on file at the office of the City Clerk, to whom requests for additional information should be addressed.

MOTORS.—Bids will be received by the Board of Prison Industries, Joliet, Ill., for 150 horsepower in motors, to be divided into the following units: Two 50 and two 25-horsepower; one 100 and two 25-horsepower, or one 75 and three 25-horsepower 220-volt, three-phase, 60-cycle motors. New or second-hand motors will be considered. C. F. Coleman, president of the Board of Prison Industries.

LAMP FIXTURES.—Sealed bids will be received by the Commissioner of Gas and Electricity, Room 614, City Hall, Chicago, Ill., until February 8 for furnishing 10,000 lamp fixtures, each complete with film cut-out series socket, two films, and without compensators or glassware, to be used with 10-ampere, 600-candlepower series lamps, strictly in accordance with specifications on file in the office. Address William G. Keith, Commissioner of Gas and Electricity.

ELECTRICAL SUPPLIES.—Bids will be received at the Bureau of Supplies and Accounts, United States Navy Department, Washington, D. C., for furnishing supplies at the following naval stations: Schedule 642, Norfolk, Va., 11 starter panels. Schedule 652, Brooklyn, N. Y., 75,000 feet of lighting and power wire. Schedule 655, 6,300 pounds of galvanized iron wire, and 3,800 pounds of annealed black iron wire. Schedule 656, Brooklyn, N. Y., 35 portable ventilating sets, and 45,000 feet of twin-conductor wire. Schedule 660, Mare Island, Cal., 800 pounds of copper wire and 150 pounds of phosphor bronze wire. Bidders desiring to submit proposals should make application to the Bureau or to the nearest navy yard purchasing office.

Financial Notes

The Crocker Wheeler Company, Ampere, N. J., has announced that the common stock of the company has been placed on an 8 per cent dividend basis, instead of 6 per cent, as heretofore. A two-per-cent dividend was declared for the quarter ending December 31, 1916, making a total of 8.5 per cent for the stock for 1916.

The North American Light & Power Company, of which Clement Studebaker, Jr., is president, has sold $42,155,000 first lien six-per-cent bonds to Powell, Garard & Company and Warren Gorrell & Company of Chicago. These bankers in turn have formed a syndicate to underwrite this issue and will offer the bonds at par and interest.

Union Electric Light & Power Company, of St. Louis, a subsidiary of North American Company, has increased its authorized capital stock from $18,000,000 to $18,040,000. Of the authorized stock, $9,885,000 are outstanding. The increase of $40,000 in the capital stock represents the cost to the company of the acquisition of the Perry County Utilities Company of Missouri.

Preliminary earnings of the Columbia Gas & Electric Company and subsidiaries for December show the largest monthly earnings in the company's history. Gross is placed at $1,011,076, an increase of $149,-895, or 17.4 per cent, and surplus after charges at $388,757, an increase of $252,921, or 186.2 per cent, over December, 1915. The preliminary figures place gross for the twelve months ended December at $9,056,-762, an increase of $1,012,230, or 12.5 per cent, and surplus after charges at $1,157,017, an increase of $776,377, or 203.90 per cent.

At the annual meeting of the Rochester Railway & Light Company the following directors were elected: Horace E. Andrews, William K. Vanderbilt, Jr., Harold S. Vanderbilt, R. M. Searle, Granger A. Hollister, John Carstensen, Walter N. Kernan, A. H. Smith, D. M. Beach, T. W. Finucane, A. M. Lindsay, E. G. Miner, and Edward Bausch. The board will meet in New York City later, and organize. New York State Railways carried 69,229,777 pass-

WEEKLY COMPARISON OF CLOSING-BID PRICES OF SECURITIES OF LEADING ELECTRICAL COMPANIES.

Quotations furnished by F. M. Zeiler & Co., Rookery Bldg., Chicago.

	Div. Rate Per Cent	Bid Jan. 22	Bid Jan. 29
Public Utilities—			
Adirondack Electric Power of Glens Falls, common	....	26	27
Adirondack Electric Power of Glens Falls, preferred	6	87	89
American Gas & Electric of New York, common	10+extra	140	141
American Gas & Electric of New York, preferred	6	50½	50
American Light & Traction of New York, common	....	371	371
American Light & Traction of New York, preferred	6	113	113
American Power & Light of New York, common	4	83	87
American Power & Light of New York, preferred	6	92	93
American Public Utilities of Grand Rapids, common	....	38	39
American Public Utilities of Grand Rapids, preferred	6	71	71
American Telephone & Telegraph of New York	...	123⅜	126¾
American Water Works & Elec. of New York, common	....	11½	11½
Americon Water Works & Elec. of New York, particip	7	27	28
American Water Works & Elec. of New York, first preferred	....	73	73
Appalachian Power of Bluefield, common	....	7½	7
Appalachian Power of Bluefield, preferred	7	38	40
Cities Service of New York, common	6	309	304
Cities Service of New York, preferred	6	93¾	94
Commonwealth Edison of Chicago	8	135½	136
Comm. Power, Railway & Light of Jackson, common	4	*59½	59½
Comm. Power, Railway & Light of Jackson, preferred	6	82½	82½
Federal Light & Traction of New York, common	....	13	15
Federal Light & Traction of New York, preferred	....	54	55
Illinois Northern Utilities of Dixon	6	84	83
Middle West Utilities of Chicago, common	2+2 extra	61	63
Middle West Utilities of Chicago, preferred	6	80½	82
Northern States Power of Chicago, common	7	105	106
Northern States Power of Chicago, preferred	7	99	99
Pacific Gas & Electric of San Francisco, common	5	64¾	67½
Pacific Gas & Electric of San Francisco, preferred	6	94½	94½
Public Service of Northern Illinois, Chicago, common	7	111	111
Public Service of Northern Illinois, Chicago, preferred	6	100	100½
Republic Railway & Light of Youngstown, common	4	48¾	49½
Republic Railway & Light of Youngstown, preferred	6	74	75
Standard Gas & Electric of Chicago, common	....	14½	14
Standard Gas & Electric of Chicago, preferred	6	41½	41½
Tennessee Railway, Light & Power of Chattanooga, common	....	9½	9½
Tennessee Railway, Light & Power of Chattanooga, preferred	6	43	43
United Light & Railways of Grand Rapids, common	4	49	49
United Light & Railways of Grand Rapids, preferred	6	77	77½
Western Power of San Francisco, common	....	18½	19
Western Power of San Francisco, preferred	6	68	67
Western Union Telegraph of New York	5+extra	98¾	98½
Industrials—			
Electric Storage Battery of Philadelphia, common	4	66¼	66
General Electric of Schenectady	8	169½	171
National Carbon of Cleveland, common	8	†300	†300
National Carbon of Cleveland, preferred	7	†130⅛	†130⅛
Westinghouse Electric & Mfg. of Pittsburgh, common	5+extra	52½	53½
Westinghoues Electric & Mfg. of Pittsburgh, preferred	7	70	70

* Extra Dividend.
† Last Sale.

engers in Rochester in 1916, an increase of 18.01 per cent above the preceding year. City cars traveled an aggregate distance in 1916 of 16,210,166 miles, an increase of 7.08 per cent over the previous year. Suburban and interurban subsidiaries of the New York State Railways also showed large increases in passengers and mileage.

The California Railroad Commission has authorized the Pacific Gas & Electric Company to issue $2,500,000 general and refunding five-per-cent bonds at not less than 90. Proceeds of the bonds are to be expended for additions and improvements to the system of the company. The construction program of the company on August 31, 1916, called for an expenditure of $6,431,488. The company prior to 1913 had expended fixed capital of $106,047,475 and expenditures since 1913 have brought this up to $127,762,415. At the time of the assuming of jurisdiction by the commission over the company its general and refunding bonds could be sold at but 85 and Vice-President Hockenbeamer informed the commission that the present issue would be sold about 90. The commission also authorized Pacific Gas & Electric to use the proceeds from the sale of first preferred stock and bonds to reimburse its treasury for expenditures, including $210,000 for raising the Lake Spaulding dam, $233,000 for canals and conduits, $68,181 for a new substation, $34,000 for land and water rights and $98,000 for new office buildings.

F. S. Stranahan, of Stranahan & Company, Boston, recently made the following statement regarding public service companies: "I believe that the next 12 months are going to show a large demand for unlisted bonds and preferred stock of public service corporations, particularly those of electric light and power and gas companies. Investors are recognizing the stability of these securities and the principal problem that the bankers are facing is to satisfy the demand of the buying public. Our own properties have made rapid and satisfactory progress during the last 12 months. The New England Electric Securities Company, which we have controlled since July, 1915, shows a good surplus and its earnings are running at the rate of over twice its bond interest. The Public Light & Power Company, operating in towns in Tennessee and Alabama, has enjoyed unusual prosperity and the earnings are showing a steady increase from month to month. Naturally my opinion would be biased in favor of securities in which my firm deals, but there is a satisfaction in knowing that the superiority of electric light, power and gas companies as safe investments is borne out by statistics covering a long period of years."

Reports of Earnings.

UTAH SECURITIES.

Utah Securities Corporation for December and the year ended December 31, reported combined earnings of subsidiaries as follows:

	1916	1915
December gross	$ 522,183	$ 459,064
Net after taxes	291,390	260,318
12 months' gross	5,583,396	4,827,725
Net after taxes	3,095,022	2,549,778

Heavy snows during the latter part of December curtailed traffic on the electric railway lines in addition to adding heavy expenses to the operation of this department, and also affected operations of some of the large consumers of electric power, thus reducing their power requirements and so cutting revenues below what they would otherwise have been.

VIRGINIA RAILWAY & POWER.

	1916	1915
December gross	$ 526,316	$ 503,449
Net	278,760	280,143
Total income	285,904	287,710
Surplus, after charges and taxes	131,197	145,669
Six months' gross	2,977,681	2,785,966
Net	1,516,926	1,478,014
Total income	1,567,822	1,528,505
Surplus, after charges and taxes	671,206	670,957

New Publications

TRANSFORMER OIL.—The Electro-Technical Labrotary, Tokyo, Japan, has published "Electrical Insulating Properties of Transformer Oil," by T. Hirobe, W. Ogawa and S. Kubo. It describes the methods and results of tests, showing that insulating value is impaired by dust and moisture. Fibrous particles especially should be avoided by filtering.

MOTORS IN SILK MANUFACTURE.—"The Silk-Throwing Industry in Northeastern Pennsylvania," by G. F. Smith and Elmer L. Kyle, a reprint of an article which appeared in the *Electric Journal*, September, 1915, has just been issued in pamphlet form by the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa. This paper describes the textile industry in northeastern Pennsylvania and describes the operations performed by the machines used.

ELECTRICAL TRADES' DIRECTORY.—Notice has been received that the thirty-fifth edition of the "Electrical Trades' Directory and Handbook," published by *The Electrician*, London, England, is being prepared and will be ready for distribution in February. The publisher announces that the 1917 edition will contain carefully compiled lists of British, colonial and foreign electrical engineers, electric light and power and electric railway and tramway engineers and contractors, electricians, consulting and manufacturing electrochemists and metallurgists, plant, machinery and apparatus manufacturers, electrical, telegraph and scientific instrument makers, electricity supply, electric railway and tramway, telegraph and telephone companies, telegraph and telephone engineers and contractors, electric cable and wire manufacturers, and of all persons engaged in electrical pursuits throughout the world. It will also contain useful technical and commercial tables and engineering data relating to electric light and traction, electric power transmission, British and colonial and foreign electricity supply and electric traction undertakings (municipal and company), industrial applications of electricity, telegraphs and telephones, wireless telegraphy, British and foreign government departments, and a biographical section, giving interesting particulars of the careers of about 200 eminent men connected with electricity in all its applications.

Incorporations

CRAFTON, PA.—J. T. Craig Electric Company. Capital, $5,000. Incorporators: J. T. Craig, P. J. Morgan and James Rooney.

CHICAGO, ILL. — Mechanics Electric Service Company. Capital, $1,000. Incorporators: S. A. Rolf, G. E. Peterson and A. E. Stein.

MILWAUKEE, WIS—Arrowhead Electric Company. Capital, $25,000. Incorporators: A. U. Stetten, L. E. Fichan and E. W. Passmore.

SEATTLE, WASH. — Auto Electric Equipment Company. Capital, $10,000. Incorporators: C. S. Huntoon, J. D. Williams and R. H. Hatch.

CHICAGO, ILL.—Klunder Electric Company. Capital, $10,000. Incorporators: John T. Janette, George H. Stellman and Eugene A. Monas.

STEUBENVILLE, O.—Maxwell Electric Company. Capital, $10,000. Incorporators: R. B. Maxwell, E. M. Maxwell, J. H. McCoy, H. A. Saulters and D. G. Maxwell.

BUFFALO, N. Y.—A. J. Dotterweich Company. Capital, $15,000. Electrical contractors. Incorporators: A. J., G. J. and A. Dotterweich, 5 Hughes Avenue, Buffalo.

PLAINVIEW, TEX.—G. O. Electric Company. Capital, $15,000. Deal in electrical goods. Incorporators: J. J. Garrison, J. E. Connor, H. C. McIntyre and others.

EAST PALESTINE, O.—Efficiency Electric Company. Capital, $30,000. Incorporators: A. J. Wayman, L. M. Kyes, W. J. Morris, J. C. Chamberlain and R. N. Chamberlain.

HACKENSACK, N. J.—Storage Battery Supply Company. Nominal capital. To manufacture storage batteries. Incorporators: G. R. Williams, 313 Main Street, Hackensack; W. J. Dailey and J. Hurst.

DOVER, DEL. — Mute-A-Phone Company. Capital, $100,000. To manufacture mute-a-phones for use on telephones. Incorporators: Ferris Giles, K. M. Dougherty, E. Lynch, Wilmington, Del.

NEWARK, N. J.—Empire Sales Company. Capital, $125,000. To manufacture motors and similar apparatus. Incorporators: J. W. Palmer, H. A. Reeves and W. Hagney. Agent, E. H. Paine, 756 Broad Street.

NEW YORK, N. Y.—K. & B. Electrical Equipment Company. Capital, $25,000. Electrical apparatus and appliances for surgical use, electric work. Incorporators: W. W. Mowry, H. Brodsky and L. Kotraschek, Corona, L. I.

BUFFALO, N. Y.—Wright-Hibbard Industrial Electric Truck Company. Capital stock, $300,000. To manufacture electric trucks, steam turbines, water motors, etc. Incorporators: R. F. Hibbard, G. A. and W. H. Wright, 48 South Division Street.

MILLBROOK, N. Y.—Modern Motor Parts Corporation. Capital, $70,000. To manufacture motor parts and operate as electricians. Incorporators: A. E. Moore, 20 Arden Street; G. F. Jebbett, 120 Sherman Avenue, New York City; F. H. Butehorn, 764 St. Johns Place, Brooklyn, N. Y.

Electrical Patents Issued January 23, 1917

Prepared by Thomas Howe, Patent Attorney, 2 Rector Street, New York, N. Y.

1,213,144. Organic Insulating Composition. L. H. Baekeland, assignor to General Bakelite Co., New York, N. Y. For coil impregnation.

1,213,149. Grinding Machine. E. J. Bodey, Cincinnati, O. Mounting of driving electric motor.

1,213,150. Method of Producing Magnetic Sound Records For Talking-Motion-Picture Films. H. C. Bullis, Redwood Falls, Minn. Method of photographing sound records on a sensitized record medium.

1,213,154. Automobile Headlight Glass. H. D. Cohen, Newark, N. J. Glazing for dimming headlights.

1,213,161. Railway Signaling System. A. V. T. Day, assignor to Hall Switch & Signal Co., New York, N. Y. Operates by de-energizing the track circuit of the block having the train and energizing the circuit of the block ahead.

1,213,162. Traffic-Controlling System for Railways. A. V. T. Day, assignor to Hall Switch & Signal Co. Signal system controlled by direct and alternating currents.

1,213,163. Electric Sterilizing Oven. N. Dedrick, assignor to C. H. Seeger, Manitowoc, Wis. Structure of oven having thermostatically controlled heating elements.

1,213,166. Electric Self-Playing Grand-Piano. C. W. Dorricott, assignor to Electrelle Co., Philadelphia, Pa. Structure of electrically operated player.

1,213,167. Magnetic Chuck and Casing. A. M. Drake, assignor to Heald Machine Co., Worcester, Mass. Details of construction.

1,213,172. Internal-Explosion Engine. W. Erwin, Philadelphia, Pa. Comprises special sparking arrangements.

1,213,174. Electric Welding Machine. P. Faszler, Berlin-Friedenau, Germany. Transformer construction.

1,213,175. Portable Electric Battery. I. Fertman, New York, N. Y. Casing and connections for superposed dry-cells.

1,213,176. Apparatus for Phonograph Kinetoscopes. R. A. Fessenden, Brookline, Mass. A loud speaking telephone, has its diaphragm arranged as a kinetoscopic screen.

1,213,180. Recovery of Zinc. C. H. Fulton, assignor to David B. Jones, Chicago, Ill. Briquets of prepared ore are placed between the electrodes of a closed electric furnace and passage of current through them heats them to distilling temperature.

1,213,182. Storage Battery. W. Gardiner, Chicago, Ill. Composition of "dry" electrolyte.

1,213,198. Train-Speed Control and Stopping Device. L. W. Horne, Brooklyn, and W. N. Crane, New York, N. Y. Air-brake is controlled by device affected by track having magnetic and non-magnetic sections.

1,213,211. Current-Distributing Apparatus. L. M. Klauber and R. C. Cavell, San Diego, Cal. Arrangement for connecting a number of service wires with a line wire.

1,213,250. Means for Receiving Intelligence Communicated by Electric Waves. G. W. Pickard, assignor to Wireless

Specialty Apparatus Co., New York, N. Y. Comprises a conducting solid acting as a rectifier for the oscillating current due to the received waves.

1,213,269. Headlight for Vehicles. F. A. Rutherford, Chicago, Ill. Reflector arrangement.

1,213,282. Vehicle Signal Apparatus. E. S. Shaw, Minerva, O. Switching arrangements for light in signal arm of direction indicator.

1,213,287. Terminal Box. E. G. Smith, assignor to Crouse-Hinds Co., Syracuse, N. Y. For securing to electric conduit.

1,213,292. Railway Grade-Crossing Protective Device. G. M. Stoll and V. S. Beam, Maplewood, N. J. Gates operated by train-controlled motor.

1,213,293. Shade Holder. A. P. Storrs, assignor to Storrs Mica Co., Oswego, N. Y. For mounting on lamp bulbs.

1,213,298. Telephone Relay. F. E. Summers, Memphis, Mo. Combination of a diaphragm with permanent and electromagnets.

1,213,309 and 1,213,310. Railway Signaling. H. A. Wallace, assignor to Union Switch & Signal Co., Swissvale, Pa. Block systems.

1,213,317. Trucking System. R. C. Weller, Chicago, Ill., and P. D. Naugle and S. T. Hyde, Bremerton, Wash. Has main track and sidings electrically connected and divided into blocks with means for controlling the electrical connections.

1,213,345. Electric Time-Stamp. C. S. Ellis, Chicago, Ill. Details of hand device adapted to be actuated from a master clock.

1,213,353. Electrical Incubator. J. D. Graves, Colton, Cal. Electrically heated.

1,213,356. Recorder. R. E. Hall, assignor of one-half to C. A. Robertson, Ann Arbor, Mich. Marker is moved by current impulses transversely of moving tape.

1,213,364. Socket for Electric Lamps. W. Herskovitz, Chicago, Ill. Has hanger ring secured to top.

1,213,365. Protecting Means for Electric Circuits. A. Herz, assignor to Delta-Star Electric Co., Chicago, Ill. Lightning arrester comprising electrolytic arrester and horn gaps in special combination with resistance and inductance. (See cut.)

1,213,384. Electric-Light Fixture. C. W. King, Oswego, N. Y. Structure of hub and radiating arms.

1,213,393. Connector for Electric Conductors. H. F. Maxim, assignor of one-half to O. Wells, Norfolk, Va. For securing conductor ends to binding posts.

1,213,406. Indicator. H. Peters, assignor to F. McD. Bill, Edmonton, Alberta, Can. Solenoid-operated roller-sign for cars.

1,213,422. Process of Electrically Welding Tubes. J. Sacek, assignor to C. H. Fischer, Charlottenburg, near Berlin, Germany. Strip is welded along longitudinal seam by resistance process.

1,213,427. Motor and Gearing Therefor. J. A. Shapard, Montour Falls, N. Y. Gear casing is mounted on end head of inclosed motor.

1,213,436. Molding Machine. L. Thomas, assignor to Societe Les Fils de A Piat & Cie, Paris, France. Electrically operated mold-jarring machine.

1,213,456. Signaling Device for Automobiles. J. K. Burleigh and L. V. White, assignors to A. L. Zwister, Kalamazoo, Mich. Direction indicator.

1,213,467. Electric Accumulator. C. De-Sedneff, Paris, France. Structure of Planté plate.

1,213,478. Meter Box. L. G. Haase, Pasadena, Cal. Rectangular structure facilitating location of lid.

1,213,495. Ignition Timer. E. B. Jacobson, assignor to J. & B. Mfg. Co., Pittsfield, Mass. Details of housing for rotary portion.

1,213,505. Fender and Tail-Light System. H. A. Lacerda, Schenectady, N. Y. Lights are of different colors and in series so that fender light indicates condition of tail-light.

1,213,507. Electric Heater. James Lawrence, assignor to S. G. Ranger, New York, N. Y. Structure of resistance unit.

1,213,528. Apparatus for Displaying Advertisements, Signaling and the Like. J. P. Naylor, London, England. Monogramic elements are electromagnetically controlled by keys.

1,213,535. Galvanic Battery. J. E. Preston, London, England. Details of removable stopper unit for container.

1,213,547. Magnetic Speedometer. F. A. Ross, assignor to Stewart-Warner Speedometer Corp., Chicago, Ill. Details of device comprising a thermostatic device and compensating shunt.

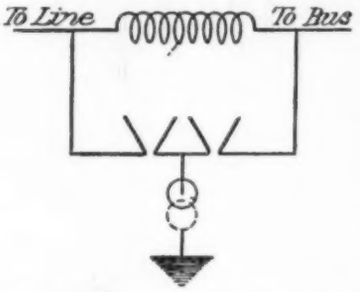
1,213,581. Spark-Plug. E. Brandquist, Orange, N. J. Has a special glass-inclosed switch for observing the spark.

1,213,595. Electric Stove. G. Deal, Omaha, Neb. Details of arrangement of heating elements and insulation.

1,213,610 and 1,213,611. Dynamoelectric Machinery. E. A. Fessenden, assignor to Submarine Signal Co., Portland, Me. First patent: Apparatus for signaling by periodic and speech-producing impulses comprising an oscillating dynamo. Second patent: Special synchronous arrangement of number of reciprocating dynamos driven by reciprocating engines.

1,213,616. Means for Producing Controlling and Utilizing Electric Currents. A. E. Fritts, assignor to J. D. Myers, Philadelphia, Pa. Circuits are controlled by varying light on selenium sections.

1,213,617 and 1,213,618. Alternating-Current Motor. V. A. Fynn, assignor to Wagner Electric Mfg. Co., St. Louis Mo. First patent: Different numbers of stator poles



No. 1,213,365.—Protective Means for Electric Circuits.

are produced and rotor winding is commutated. Second patent: A squirrel-cage rotor is employed.

1,213,632. Electrical Connector. W. P. Hammond, Passaic, N. J. For securing conductor ends to binding posts.

1,213,637. Jump-Spark-Plug. F. H. Heginbottom, assignor to S. H. Heginbottom, Saginaw, Mich. Details.

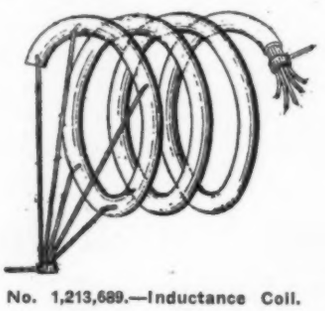
1,213,654. Thermostatic Fire-Signal. A. B. Jones, San Francisco, Cal. Thermometer-controlled alarm circuit.

1,213,660. Train-Stopping System. P. Kuhn, Hammond, Ore. Operates according to the position of a track switch.

1,213,689. Inductance Coil. D. R. Price, assignor to G. K. Woodworth, Brookline, Mass. The method of reducing to a minimum the fluctuating current resistance of a coil having a stranded conductor. (See cut.)

1,213,702. Governor for Electric-Lighting Generators for Motor Cars. H. C. Humphrey Smyth, London, England. Centrifugal device.

1,213,705. Electric Cut-Off Mechanism. M. M. Stevens and T. J. Newcomb, Hast-



No. 1,213,689.—Inductance Coil.

ings, Pa. Electrically controlled switching mechanism for trolley cars.

1,213,709. Signal for Automobiles. R. W. Thibodeau, Quincy, Mass. Structure of switch controlled by steering wheel.

1,213,714. Electrically Indicating Weather-Vane. F. L. Washburne and G. E. Kimmerle, Brooklyn, N. Y. Comprises contacting devices for transmitting signals as to its position.

1,213,723. Indicator System. A. Zeisel, Bel Air, Md. Indicator is connected in circuit and operates by relative values of resistances which are wound and unwound upon and from drums.

1,213,726. Impregnated Coil and Method of Making the Same. L. H. Baekeland, assignor to General Bakelite Co., New York, N. Y. Method of making coils for electrical uses.

1,213,738. Rail-Bond. G. H. Burge, Huntsville, Mo. Manner of securing bond to rail.

1,213,751. Electric Switch. J. S. Crossley, Solvay, N. Y. For lamp sockets.

1,213,753. Signaling Device for Motor Vehicles. M. J. Dalton, Chula Vista, Cal. Direction indicator.

1,213,754. Flashlight Lamp. F. David, assignor to Enterprise Electric Novelty Co., New York, N. Y. Details.

1,213,777. Inclosed Fuse Element. E. E. Roberts, assignor to Johns-Pratt Co., Hartford, Conn. Manner of supporting and connecting end terminals and ribbons connected between them.

1,213,782. Air Cooling Device. W. H. Thomas, assignor of one-half to E. W. Lohse, Portland, Ore. Arrangement of tanks with liquid-conveying wicks over which air is blown by an electric fan.

1,213,784. Illuminated Number-Plate. H. Walker, Anaheim, Cal. For automobiles.

1,213,789. Ignition Apparatus. E. D. Allensworth, Waukegan, Ill. Details of timer and spark distributor mechanism.

1,213,790. Igniting and Spark-Distribution Device. E. D. Allensworth, Waukegan, Ill. Modification of above.

1,213,794. Automatic Gear Shift for Automobiles. A. N. Chenoweth, Waterbury, Conn. Electromagnetically controlled by a switch controlled by a lock and key.

1,213,799. Electric Circuit-Breaking Device. F. S. Perrin, assignor to Splitdorf Electrical Co., Newark, N. J. Interrupter for ignition circuits.

1,213,803 and 1,213,804. Art of and Apparatus for Generating and Distributing Music Electrically. T. Cahill, assignor to E. Spear, E. H. Jackson, G. F. Cahill, A. T. Cahill and T. Cahill, New York, N. Y. Key-controlled electrical vibration generating devices.

1,213,809. Electrical Compression Resistance Unit. P. J. Ray, Lakewood, Ohio. Comprises conductor members whose surfaces are coated with carborundum mixed with silicate of soda.

Reissue 14,252. Electrical System for Automovehicles. R. Varley, assignor to Varley Duplex Magnet Co., Jersey City, N. J. Original No. 1,185,151, dated May 30, 1916. Utilizes alternating current for ignition and direct current for lighting.

PATENTS EXPIRED.

The following United States electrical patents expired on January 30, 1917:

642,081. Process of Unhairing Animal Hides or Skins. G. D. Burton, Boston, Mass.

642,102. Electric Signaling Device for Crossings. O. Fuchs, Dresden, Germany.

642,123. Dynamoelectric Machine. E. W. G. C. Hoffmann, Charlottenburg, Germany.

642,141. Web Shifter and Regulator. F. Lyon, Ithaca, N. Y.

642,159. Electric Switch. I. Robbins, Camden, N. J.

642,164. Alteranting-Current Wattmeter. K. O. F. Schrottke, Berlin, Germany.

642,167. Electric Sparking-Plug for Explosive Engines. F. R. Simms, London, England.

642,169. Grounding Shoe for Electric Wires. T. H. Stokes, Lincoln, Ill.

642,216. Unit Multiple System of Control for Electric Railways. F. C. Esmond, New York, N. Y.

642,252. Automatic Electric Heat and Fire-Alarm System. R. P. Osgood and J. D. Osgood, Methuen, Mass.

642,332. Safety Device for Elevators. M. M. Hunter, Milwaukee, Wis.

642,362. Signal. M. Pfatischer, Philadelphia, Pa.

642,363. Trolley Pole. F. Pfent, Grenier, and L. A. Moran, Grosse Point, Mich.

642,364. Electric Motor. E. S. Pillsbury, St. Louis, Mo.

642,379. Electric Signaling Apparatus, H. W. Souder, Tamaqua, Pa.

642,408. Sanitary Attachment for Telephonic Appliances. A. J. Wolff, Hartford, Conn.

642,414. Manufacture of Electrical Resistances. J. F. Bachmann and A. Vogt, Vienna, Austria-Hungary.

642,424. Maximum Indicator. C. R. Brown, Dedham, Mass.

642,457. Break Indicator for Twisting Machines. G. F. Ivey, Forest City, N. C.

642,521. Junction Box for Electrical Conductors. E. T. Greenfield, New York, N. Y.

642,536. Combined Dental Engine and Chair. C. C. Southwell, Milwaukee, Wis.

642,551. Mechanism for Driving Dynamos for Electric Lighting on Railway Cars, etc. P. Kennedy, New York, N. Y.

642,553 and 642,554. Rail Bond. C. J. Mayer, Philadelphia, Pa.

642,563. Electrical Measuring Instrument. F. M. Bennett, New York, N. Y.

Design 32,160. Battery Plate. J. T. Storey, Philadelphia, Pa.

Design 32,161. Electrode or Battery Plate. W. F. Richards, Buffalo, N. Y.

Design 32,162. Telephone-Receiver Holder. C. D. Wilson, Columbus, O.